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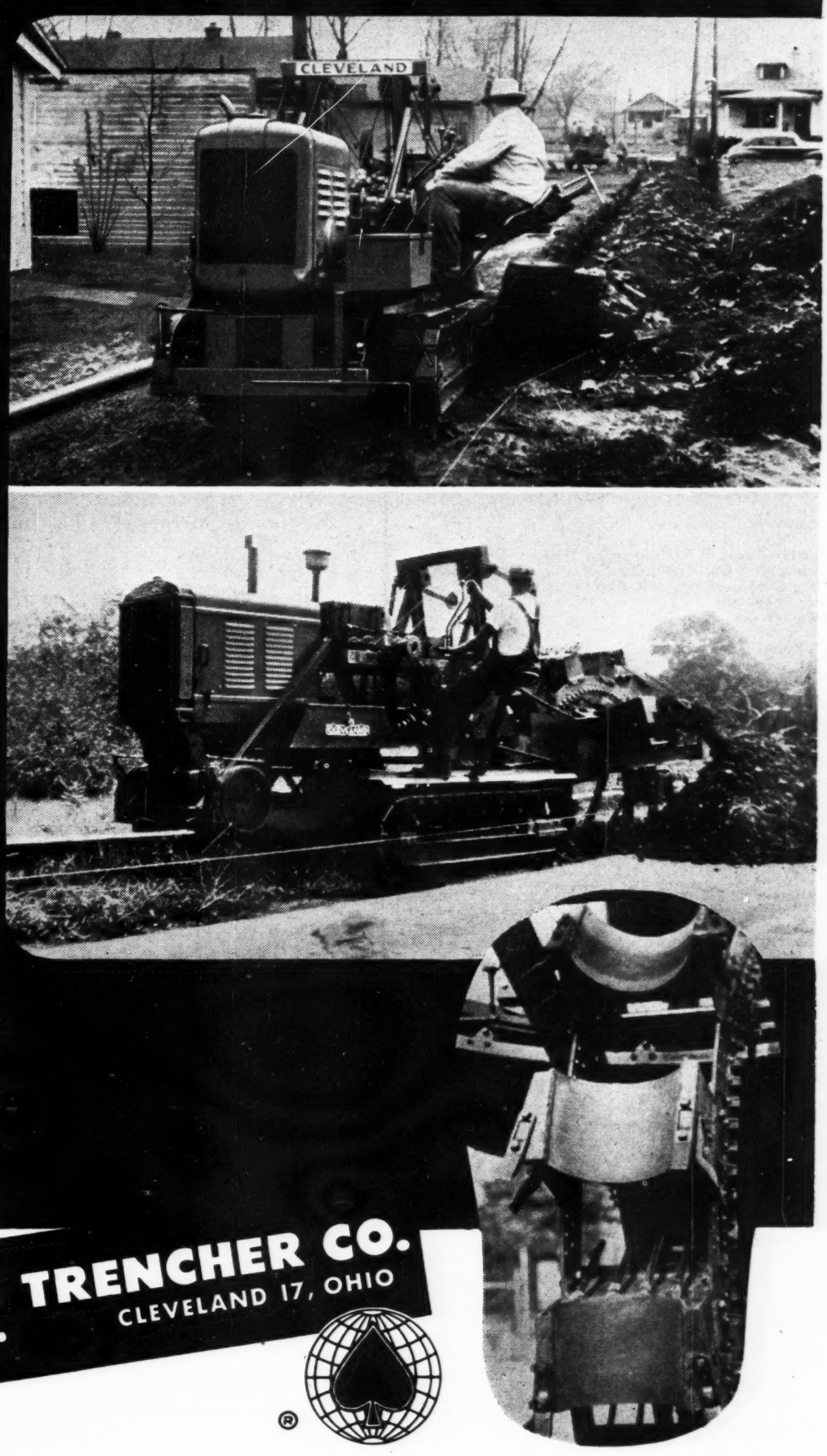

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GAS

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Twenty-Fifth Year of Publication

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Highlights

CANADA-SEATTLE LINE PROSPECTS BRIGHTEN. On the heels of Alberta's approval of bills of incorporation for five new major pipeline companies, Westcoast Transmission Pipe Line Co. announced it was starting surveys on a 1400-mile, $175 million line to run as far as northern California. Gas export approval by the province and the dominion, as well as FPC certification of an American carrier, are hurdles still to be jumped, however.

THE U. S. IS GOING TO SUE LOUISIANA AND TEXAS. The Supreme Court has given an okay to the Justice Department to bring suit for control of oil-rich Gulf tidelands, using as a precedent the high court's decision in the California tidelands case. If it wins its case, it would want an accounting of all monies collected since the California case decision in June, 1947. The court gave both state and federal governments until September to file their cases; Texas' attorney general, Price Daniel, hopes to clear a bill in Congress giving states clear title before that date.

NATURAL GAS IN NEW ENGLAND BY 1952. So predicted Gardiner Symonds, president of Tennessee Gas Transmission Co., before the New England Council in Boston last month. He said it would reach Buffalo, N. Y., by 1951.

SAN JUAN-TO-SAN FRANCISCO LINE APPLICATION NOW BEING HEARD. The FPC was scheduled to start hearings May 31 on an application of El Paso Natural Gas Co. to carry gas from San Juan basin in New Mexico, Colorado, Utah, and Arizona, to Pacific Gas & Electric Co.'s system. El Paso would build 451 miles of line to the California-Arizona border, and would serve six Arizona towns en route. PG&E would receive 150 MMcf of the total 165 input, and is asking approval of a boost to 400 MMcf in capacity of facilities approved in the Permian basin-to-San-Francisco docket approved last February. (See *GAS*, April, 1949, p. 33.)

TEXAS GAS MEASUREMENT BILL FAILS TO REACH SENATE FLOOR. The bill, which would prescribe a legal definition of a "cubic foot of gas," missed being brought up last month by a one-vote margin.

BIG DOINGS REPORTED IN SOUTHWESTERN VIRGINIA. A wave of exploration reportedly unequalled elsewhere in the United States is locating some hitherto untapped sources of gas—mainly—and oil. Many firms have joined in the search; one of the more successful to date, according to available information, is Clinchfield Coal Corp., which has already brought in one well producing 1.8 MMcf per day.

PENNSYLVANIA RAILROAD IS COOKING WITH RADAR. Experimental installations are being made by Pennsy, which would like to add some short-run business to its regular dining car trade. The tests are being performed on only a limited number of trains at present.

TRUNKLINE APPLICATION CERTIFICATED. The FPC has okayed Trunkline Gas Supply's 810-mile line from Edge, Texas, to Palmyra, Neb. A moot point in the hearings was whether Northern Natural Gas Co., which will take the gas from Trunkline, should charge separate (higher) rates for customers receiving gas from the new line, or should keep all rates, including those to present customers, uniform. The FPC declined to rule on this, declaring the question outside its purview.

SOUTHEASTERN PIPELINE APPLICATIONS STILL AREN'T READY FOR HEARINGS. Last month, Southern Natural Gas Co. and Atlantic Gulf Gas Co., whose hearings on applications for lines to carry gas from the South to the Florida-Georgia areas were set for May 16, asked for and got extensions until Aug. 22. Previously the FPC, weary of carrying the applications on the docket after two years, had ordered final hearings after a two-year delay during which the companies allegedly failed to add required data to prove their respective cases. Southern Natural's plea called for a 375-mile line from Mississippi to Atlanta, with extensions to Colfax, Ga., Tallahassee, and Jacksonville, Fla., and Savannah and Georgetown, S. C., Atlantic Gulf wanted to build a line from Mississippi to Jacksonville and Georgetown.

Natural Gas Producers

Here's the "PAY-OFF"

EARNINGS from the recovery of raw gasoline from your natural gas quickly pay for a Blaw-Knox Gasoline Absorption and Stripping Plant. Condensible hydrocarbons are removed from the gas, insuring a hydrocarbon dewpoint within limits prescribed by the gas transmission companies. Fractionating equipment may readily be added to produce stabilized gasoline and liquefied petroleum gases.

The smaller plants are ideal for the smaller leases and remote locations. No steam or electricity is required and only a small amount of cooling water make-up is needed. All plants regardless of size are compact, economical and automatically controlled. Ask for Bulletin 2225.

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THERMALLY THINKING

By EDWARD TITUS

outlook for conservation

A VERY SIGNIFICANT TALK was given by William J. Murray Jr., chairman of the Texas Railroad Commission, at the natural gas spring meeting. Under the title "Natural Gas Problems in the Territory of Greatest Reserves," Commissioner Murray summarized developments and current thinking in Texas and doubtless in important neighboring producing states. on gas and oil matters. He reviewed price matters, restrictions on export, uniform standards of measurement, regulations both federal and state, ratable take and conservation.

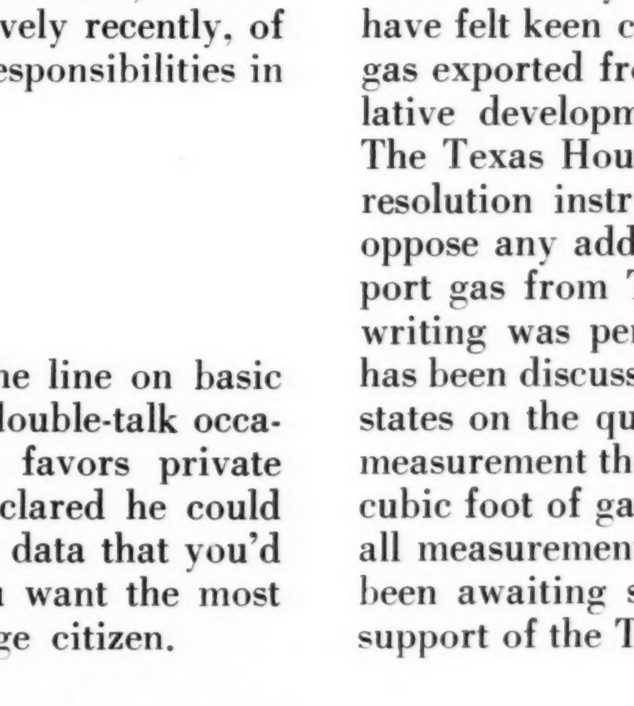
As a sequel to the talk a year ago at the natural gas meeting in Houston, at which D. A. Hulcy, president of Lone Star Gas Co. of Dallas, told how the industry had been making progress in natural gas conservation, Commissioner Murray praised the industry for its cooperation, and at the same time attempted to give some idea of what was likely for the future. His statements are of added interest, in view of his having become chairman. comparatively recently, of a commission with very large powers and responsibilities in the natural gas picture.

waste is intolerable

Mr. Murray was frank. He laid it on the line on basic economic questions (but with none of the double-talk occasionally heard along the Potomac). He favors private property, and is against socialism. He declared he could prove by hard-boiled facts and engineering data that you'd better not change the U. S. system, if you want the most possible good things of life for the average citizen.

Public opinion. Mr. Murray points out, is beginning to consider waste intolerable. He predicts more stringent restrictions on production of natural gas from the gas cap of an oil reservoir. to prevent loss of oil. Mr. Murray hopes that a system will soon be evolved for adjusting equities, so that even greater conservation will be attained than at present, and yet no property owner having oil or gas reserves will be deprived of his rights.

Essentially all flaring from gas wells in Texas has now been stopped, and most of the gas presently being flared is natural gas produced incident to production of crude oil. This gas, generally called casinghead gas, has been burned in flares throughout the history of the oil industry. Many producers have long argued that it is not waste to flare casinghead gas.



Gradually, however, Mr. Murray continued, it has been found feasible and profitable to gather, process, and market the gas produced from oil. He conceded, however, that the conservation program is going to cost the industry a considerable sum, and that casinghead gas is not as convenient to market as gas from natural gas wells.

Showing the great progress in conservation of casinghead gas, Mr. Murray pointed out that only four years ago, in 1945, the flare volume of casinghead gas had been estimated as 57% of the total volume of it produced. Comparing March, 1945, with March, 1949, he noted that in 1945, the quantity flared was in excess of 300 MMcf a day; in 1949, it is only 47 MMcf daily.

what about export?

Mr. Murray said frankly that many citizens of Texas have felt keen concern over the rapid increase in volume of gas exported from the state. In this connection some legislative developments he mentioned are food for thought. The Texas House of Representatives has recently passed a resolution instructing the railroad commission to actively oppose any additional interstate pipelines which would export gas from Texas; and action on the resolution at this writing was pending before the senate. Meanwhile, there has been discussion in Texas and other important producing states on the question of establishing a standard system of measurement through legislation. A bill defining a standard cubic foot of gas and requiring it to be used as the basis of all measurements has passed the Texas house, and also has been awaiting senate action. The measure has the active support of the Texas Independent Petroleum Producers and Royalty Owners Assn.

In an effort to give his hearers some idea of what trends to expect in the future, Commissioner Murray predicted the following:

That the evolution of gas proration will roughly parallel what occurred in oil production about 15 years ago.

That a situation will arrive in which the total market for gas from Texas will be divided among all the gas fields in the state upon some reasonable basis, and the market thus assigned to each field will be divided among producing wells in the field on an equitable basis.

That first consideration, however, will likely be given to the casinghead

gas which is available for market, and allowables will not be assigned to gas wells until the casinghead gas, which otherwise would be flared, has been furnished a market.

Mr. Murray does not anticipate that the commission or any other regulatory body will ever attempt to require a gas pipeline to offer a market for casinghead gas from a particular oil field or connect to any certain gas well.

gas allowables?

Essentially, he says, the same procedure will likely be followed as is today followed in allocating market demand for oil. If, today, certain wells in a given oil field are without pipeline connections, no pipeline is ordered to connect with them. But the commission assumes this to be evidence that oil is being produced in excess of market demand from the field, and cuts back on the allowable for the field until pipeline connections have been offered to the unconnected wells.

Likewise, if an entire oil field is without a market, the commission does not attempt to require any purchaser to take this oil, but considers this to be evidence that the state as a whole is producing in excess of market demand. Overall cuts in allowables for the state generally result in markets being made available to the fields which have been without opportunities to sell their oil.

Future developments, said Chairman Murray, may demonstrate that such procedure is applicable to gas.

Now comes the stage of working out details of policy.

mobile radio report

THE CREDITABLE JOB by the gas and electric utility industries in presenting their needs for adequate frequencies for mobile radio service has received recognition from the Federal Communications Commission in its report on allocation of these frequencies.

Said the commission:

"The national committee for utilities radio presented a comprehensive national frequency assignment plan with respect to the use by the utility industry of all the frequencies that have been allocated to it. The commission believes that a possible solution to frequency assignment problems lies in the development of such plans and that something similar might be worked out to the advantage of many of the service groups that use radio in their operation."

While the FCC report is a long one, and the industry's specialists have not yet had time to analyze it fully, it appears that in general the utility industry has established to the satisfaction of the authorities the strategic and essential nature of its mobile radio needs.

Utilities apparently are not going to be lumped—as was once feared—with a lot of less essential industries in the parcelling out of radio frequencies. This is important, because angling for frequencies will become more and more competitive as more and more industries and individuals learn the benefits of mobile radio.

basis for allocation

Apparently long-haul natural gas systems having no major distribution properties will receive their allocations of frequencies along with the petroleum service; and those with primarily distribution properties, with the power service.

A problem is presented here for those who will attempt to make up a national frequency assignment plan, since in many cases it may be difficult to determine whether a company is primarily a pipeline or a distribution company.

However, the demonstrated willingness of members of the committee to burn the midnight oil, and to roll up their sleeves to work on such problems, plus recognition by the FCC of the validity of the industry's need for a high priority in allocation of frequencies, appear to give assurance that details like the above will be worked out satisfactorily. The utilities committee is holding a meeting in the Stevens hotel in Chicago June 7.

In any event it is certain the importance of mobile radio in many gas company operations is well established. This was demonstrated by the interest shown in it at the Distribution, Motor Vehicle and Corrosion Conference in Cincinnati this spring.

off his chest

GAS MEN HAVE MANY HOBBIES. Some like fishing in the Gulf. One at least is a singer and lyricist, and wouldn't do badly in a musical comedy. Here's what John J. Bourke, director of commercial gas cooking promotion of the American Gas Assn., brought down the house with at the final luncheon of the Southern Gas Assn.'s meeting:

(To the tune of Buttons and Bows)
Cubic feet and kilowatts
And the wrong one I have chose.
Made a change to an electric range
With its fancy gadgets that the salesman shows
Now I'm paying through the nose.

Takes all day to heat it up
And a fuse it often blows,
My monthly bills are high as the hills
Had to sell my horse and hock my clothes
I've nothing to wear but buttons and bows.

Give me a gas range
A model that's "CP"
And I'll be switchin'
To a New Freedom Kitchen
'Cause that's the one for me.

Electric's fine for a trolley line
Or to light up Broadway shows
But for cookin' I'm sour on electric power
I'm broke from hiring men to do the wiring
The terrible service has me nervous
Each week an element, tell me why in hell it went
Switch breaks down, thermostat goes
I'm tired of paying through the nose!

An addition indeed to the literature of competition for the year 1949 A. D.!

A BONUS

Next month, *GAS* will present its special Safety Issue. Aside from the usual treatment of news of the gas utility and pipeline industries, the entire magazine will be devoted to the many phases of the subject of keeping gas in first place as the safest fuel—and of assuring safe working conditions in all departments of gas operations. Watch for it—off the press early in July.

TECHNICAL TRENDS

by Guy Corfield

Ultrasonics

IN THE APRIL 1948 ISSUE, in this column, under the same heading, a short discussion was presented of laboratory scale phenomena produced by high frequency high energy sound waves. The Ultrasonic Corp. of Cambridge, Mass., now announces its Model U-4 Sonic Generator as a new tool for laboratory, pilot plant and production use. It is stated to be the first high intensity sound generator ever offered for gas phase use, permitting frequencies from 500 to 22,000 cycles per second, output over 300 watts and intensity levels up to 165 decibels. It is further stated that this generator is finding wide use in many process industries and (of possible application in the gas industry) may be used for difficult dust, fume and mist collection problems, as high intensity sound waves effect agglomeration of extremely fine particles in gas streams and the aggregates thus built up may then be efficiently collected by cyclones or other conventional removal means.

It might be interesting to relate the above terminology to more familiar manifestations and concepts. As regards cycles the piano, the widest range musical instrument (except for overtones), goes from 20 cycles per second in the bass to 5000 cycles in the treble. The limit of acute human ear perception is from about 10 to 16,000 cycles per second, the upper level corresponding to overtones on string instruments, the jingle of keys, squeak of hinges, chirping of insects, etc., Three hundred watts is about one-third of the electric consumption of a domestic electric iron. Twenty decibels (a decibel being the unit of sound intensity) is about the sound level of rustling leaves or quiet conversation; 50 decibels, an average office or noisy home: 100 decibels, a loud street noise or a boiler factory; and 120 decibels, thunder or nearby artillery—deafening, and approaching the threshold of feeling.

Silicones

SILICONES ARE a relatively new type of product developed and marketed by the Dow Corning Corp. They include a series of liquids of varying viscosities, varnishes, and resins and greases, stated as being formed from sand, brine, coal and oil, and having a structure consisting essentially of silicon and oxygen atoms joined to each other and to organic carbon-hydrogen combinations such as the familiar methyl group.

This chemical structure is particularly stable, and imparts to the silicones unusual resistance to heat, cold, temperature vs. viscosity changes, oxidation and water. They therefore should be of interest to the gas industry, and numerous applications are possible. One is as a plug cock lubricant or stock cock grease, the operating temperature limits being stated as —40°F to 500°F. They are also said to be excellent hydraulic liquids, leather diaphragm impregnants, rubber gasket surfacing agents (to prevent sticking), and to be noncorrosive, non-inflammable, and non-toxic to human skin and membranes.

Of a more indirect interest, the silicones have excellent dielectric properties and are incorporated into a variety of electrical insulating materials.

New Cooking Utensils

THE CURRENT DEVELOPMENTS in laminated or "clad" sheet metals become of direct interest to the gas industry as they apply to appliance construction and particularly to cooking utensils. These clad metals are a far cry in both strength and performance, and in variety, from the former "plated" products; and they are now fabricated in rolling mills devoted exclusively to their production.

In recent months we have seen cooking utensils develop beyond solid copper and aluminum and into stainless steel; and further into the clad wares, such as normal mild steel with stainless clad steel on both sides, and stainless steel with copper clad exterior. One of the latest products is *copper, clad on both sides with "18/8" stainless steel.* This would almost seem to be the ultimate, as it combines the high heat conductivity of copper with the corrosion resistance and attractive appearance of stainless steel. This metal product is made by American Cladmetals, under the trade name of "Rosslyn Metal." The line of restaurant cooking utensils is produced by Lalance & Grosjean Mfg. Co. of Woodhaven, L. I.

Aluminum Enamels

THE DUPONT CO. has recently announced the commercial availability of vitreous enamels for some alloys of aluminum, which may be of interest to gas appliance manufacturers as well as producers of other household appliances, sanitary wear, outdoor furniture, architectural tile, etc. These enamels are fired on aluminum strips, sheets, tubes or castings, in furnaces similar to those used for steel enameling.

It is stated that these new enamels contain a high percentage of lead, and are therefore not suitable for coating cooking utensils or other articles that come in continued contact with food.

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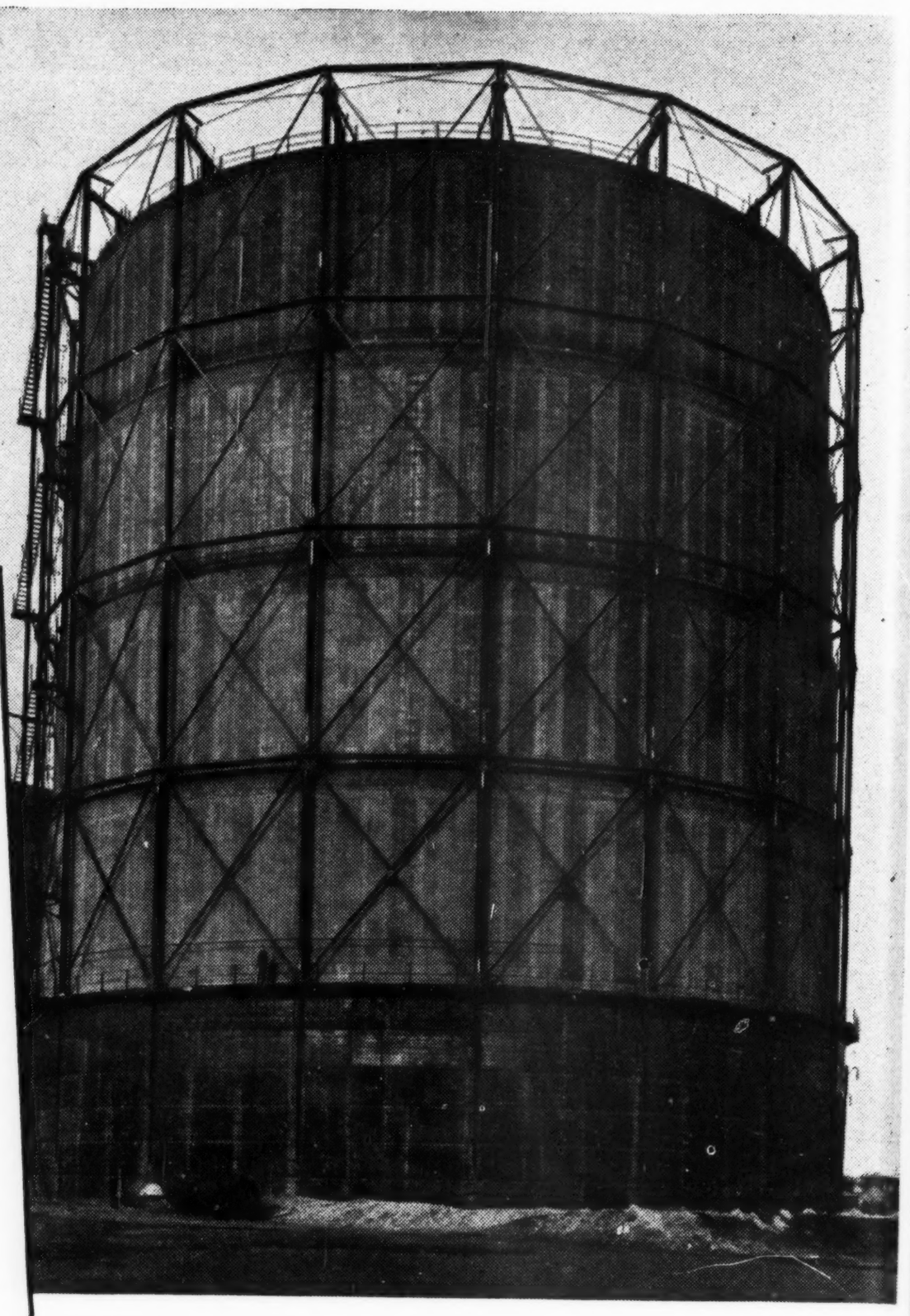


[redacted] GAS LIGHT COMPANY
240 MAIN STREET [redacted]

December 31, 1948

A. E. Harvey
Vice President
Stacey Brothers Gas Construction Company
Cincinnati, Ohio

Dear Mr. Harvey:

It is with considerable personal satisfaction that I write you this letter concerning the 3M² Foot Holder in our [redacted] Plant. I took considerable kidding from some manufacturers that it would be impossible for you to meet the schedules quoted at the time we signed the contract. That you were able to do so must be equally satisfying to you.

The Holder was in service December 23, 1948 and on December 25, 1948, Christmas day we had an all time peak send-out. This is almost as close timing as we had on the Relief Holder in [redacted].

Your Mr. William N. McDaniels, did an outstanding job as you must know he would. Our people were very much impressed with his ability and the results certainly proved this.

Please pass along to Al Azar our thanks and to you again.

Best regards for the New Year.

Very truly yours,

[redacted]
Vice-President

[redacted]

Another 3,000,000 Cubic Foot STACEY BROTHERS All-Welded Panel Wet-Seal Gas Holder

The letter speaks for itself—an actual, unsolicited testimonial of Stacey Brothers *service.*

Ability to meet contract delivery dates comes only as a result of long years of design, fabrication and erection experience—and we've had more of it than any other supplier.

Since we first introduced our patented All-Welded Panel design, we've built more than 100,000,000 cubic feet of holder capacity—78 holders over 100,000 cubic feet in size, including the world's largest (10,000,000 cubic feet)—and a whole host of smaller ones.

The service you get from a Stacey Brothers holder doesn't stop when the contract erection date has been met—it *starts* then. All-welded construction gives longer life, greater freedom from rust, fewer repairs, lower maintenance costs, less down time. Prove it to yourself by inspecting a Stacey Brothers holder installation—there's one near you. May we give you the name and location?

STACEY BROTHERS GAS CONSTRUCTION CO.
One of the Dresser Industries
5535 VINE STREET • CINCINNATI 16, OHIO

For an interesting illustrated 50-page catalog on Stacey Brothers Patented, All-Welded Panel-Type Holders, write for Bulletin W-45.

Stacey Brothers
ALL-WELDED GAS HOLDERS

PROMOTIONAL NOTES AND NOTIONS

by Stanley Jenks

Safeguarding the Load

NEXT MONTH, *GAS* publishes its special safety issue, dedicated to describing the lengths to which our industry has gone in all phases to make gas service as available today as foolproof as humanly possible.

This page is concerned primarily with safeguarding and developing the gas load, mainly by the promotional selling of modern gas appliances and equipment.

Our industry, as has been said before, is wonderfully blessed by having behind it an array of manufacturing talent such as no other industry possesses. If you doubt this, try to name one.

Our CP gas range is incomparably the best type of cooking equipment available anyhow or anywhere. Our automatic gas storage water heaters dependably deliver the goods any hour of the day or night, year in and year out, without any more effort on the user's part than turning the hot water faucet.

Silent gas refrigeration, without moving parts or interruptive hazards, is synonymous with the ultimate in refrigerated food preservation.

And as for gas heating—either local or central—what fuel can match its simple control and reliability? The nationwide backlog for gas heating alone answers the question.

Therefore, the safety and development of our present volume of sales hang fundamentally on the continued availability of high quality gas appliances and equipment.

They remain available so long as our manufacturers have (1) a profitable market for their products and (2) an unhampered channel of distribution. The latter, of course, implies a mutual manufacturer-utility interest in gas appliance sales. In other words, practical cooperation on the firing line.

Then the safety of the gas load will be assured.

Comparable Prices

WE ARE HEARING quite a lot these days about "grass root" thinking, or going to sources for ideas.

Ernest O. Thompson, a member of the Texas Railroad Commission, for example, thinks natural gas prices at the wellhead are too low if compared with crude oil on a calorific basis.

Mr. Thompson takes a barrel of crude oil selling for $2.65 in comparison with 6 Mcf of natural gas, both having approximately the same Btu content. On this basis, the natural gas in the field should sell for 44 cents per Mcf.

While the comparison in value is very flattering to natural gas, there are other factors to be considered in pricing it, such as cost of production, and beyond that stage, the cost of distribution, so that it arrives properly pressurized at the point of use economically.

Hot Water Instantly

RIGHT NOW, the GAMA "Court of Flame" national automatic water heater sales campaign is really getting into stride. June has always been a good gas water heater sales month since we started to do a mass-selling job on this appliance some 25 years ago.

The remarkable thing about today's market, when you come to think about it, is that there are more real "prospects" available now than when we pioneers tackled the job with higher priced gas and considerably higher price tags. (Them was the days. Ouch!)

Today, backed with millions of satisfied users, whose back fence help simply cannot be measured in dollars, we have nationally an estimated 15 million homes unblessed with automatic gas water heating service. How are they getting their hot water, assuming the furnace coil is colder than the furnace itself?

There are many ways, ranging from a pan on the stove, a bucket-a-day, to a hook-up on the oil burner. Not one substitute can begin to match our gas automatic way. And you can include the electric job in that too.

Of course, we won't get them all, but the vastness of the opportunity, supported by national advertising by AGA and manufacturers amounting to better than $650,000 alone, plus the local advertising of campaign participants, makes the avowed national goal of 2 million units seem a very modest one indeed.

By the end of the year, any gas utility that is going to be satisfied with less than 15% of its "prospects" has really missed the bus.

School for Skilleteers

MY RECENT REMARKS about cooking classes for men in England bring a reminder from Pierre Vinet, director sales promotion, Geo. D. Roper Corp., that his company has been doing exactly this for the last 10 years. They have a fraternal order, shall we say, known as "The Roper Knights of the Sauce Pan," and membership belongs to the dealer or salesman who can prove to the complete satisfaction of a trained home economist or sales supervisor that, cooking with gas, he is a skilled skilleteer and competent cake baker. Only then, he gets his membership certificate.

It is good to have the idea confirmed by such a distinguished organization in the promotional realms of gas cooking.

"Stay out of here folks.... this hot stove will fry you!"

WHEN the first gas range, with its promise of a cool kitchen, was exhibited at the Philadelphia Centennial Exposition in 1876, little did its sponsor dream of a market of 21,000,000 homes. For that is the extraordinary number of residential customers now served by gas for cooking, refrigeration, or home heating.

Water supply and sanitation also made extraordinary progress in the half-century since 1899, the year our Company was established. Today, 12,000 water works furnish 85 million people with a dependable supply of safe, palatable water. Over 6,000 sewage treatment plants contribute to the health of the nation.

In these three progressive branches of public service—gas, water supply and sanitation—are customers who have been buying pipe from us for 50 years. They know that we, also, have made signal progress, from decade to decade, in developing and perfecting better methods for the production of better pipe.

To those responsible for the great progress in water supply, gas and sanitation service and their contribution to better health and living over the past fifty years, America pays tribute.

U.S. CAST IRON PIPE

1899-1949
U. S. Pipe & Foundry Co.
Makers for 50 years of cast iron pipe for water, gas and sewerage service.
General Offices: Burlington, N. J.

How An Investment Company Views The Industry

By EDWARD TITUS

IN order to avoid failing to see the forest for the trees, it is worth while occasionally to take a general look at the gas industry. When the look is taken by an outside organization, there is the advantage of a detached, impartial viewpoint.

Exclusive

Recently the oil and natural gas division of the investment counsel department of the Empire Trust Co., New York, made such a study of the natural gas industry, including producing, transporting and distributing companies. It would serve as a good primer for an investor or other person starting out from scratch to learn about the industry.

Growth Potential

Skipping over fundamental material, one comes to analysis of the growth potential. *Table I* compares natural gas sales by areas with total income payments to individuals by areas.

In other words, natural gas consumption varies from 60 cu ft per dollar income in the West South Central States of Texas, Louisiana, Oklahoma and Arkansas to zero consumption in New England.

"It is interesting," the study continues, "to apply the West South Central rate of consumption to the country as a whole to find the potential future demand (assuming natural gas becomes adopted as the universal heating fuel). The result is 11.4 trillion cu ft, which is 4½ times 1947 sales. Natural gas would then account for 62% of the total energy consumption in the country, assuming no increase in overall consumption. Such growth is improbable, but it is of interest as an indication of potential demand."

Since the potential demand for natural gas is so great, the study continues, the questions of available supply, which is still rising, and transportation assume paramount importance.

A survey by the AGA mentioned in the study indicates that natural gas companies will continue the current high rate of construction through 1952, and by that time the entire industry will have spent the equivalent of 55% of the $6 billion presently invested in the business (including manufactured gas).

The current overall expansion program of the natural gas pipeline industry has been estimated by the Federal Power Commission to cost around $1.2 billion and to increase total pipeline capacity by 100% over the 1945 level. The effects of the construction recently completed are indicated by the fact that takings of natural gas in Texas by pipelines increased 22% for the first half of 1948, as compared with the corresponding months in 1947.

Reaction to Regulation

While FPC regulations have been a matter of considerable controversy, it is of interest to note Empire Trust's reaction to these regulations as affecting the investment value of companies.

The study points out that the FPC has jurisdiction over transportation of natural gas in interstate commerce and its sale in interstate commerce for public consumption. It has power to regulate rates charged to customers and uses a rate of return on capital of 6 to 6½% (of depreciated cost) as a yardstick in judging whether such rates are proper.

Recently, the study notes, the FPC has assumed authority to determine allocation of deliveries of gas even irrespective of existing contracts. And the commission also has interpreted its authority to apply to the production operations of companies engaged in gas utility business, and has subjected profits on production to the same limitations as utility profits.

Field Price

The industry knows only too well the significance of the remark in the study that "Since production properties are often on the books at very low figures this results in earnings on these operations being held to a small fraction of the earnings which would result if prevailing field prices were obtained."

The bank's study confirms gas industry feeling about the difficulty of carrying out the suggestion by an SEC spokesman at the last AGA convention that a larger proportion of capital raised should be equity capital.

"Industry spokesmen," the study notes, "protest that the low return allowed on capital does not attract equity money except where a substantial leverage is obtained from borrowed funds. The current equity market, moreover, would have difficulty in digesting the quantities of securities which current expansion plans call for if risk capital comprised a substantial part of total funds raised."

The study notes that profits higher than 6 to 6½% of the rate base are often allowed if the FPC is convinced that increasing costs or other factors would result in a reduction of return within a reasonable time.

"Delays caused by rate hearings,"

TABLE 1. NATURAL GAS CONSUMPTION AND INCOME

Divisions	1947 Total Natural Gas Sales* MMcf	1947 Total Income Payments to Individual (Mn. $'s)
New England	0	13,194
Middle Atlantic	180,930	46,790
East North Central	386,127	42,615
West North Central	321,893	16,891
South Atlantic	131,284	20,296
East South Central	142,716	8,947
West South Central	826,982	13.766
Mountain	164,405	5,889
Pacific	360,914	21,346
Total	2,515.251	189,734

*By public utilities.

the study continues, "also sometimes result in greater-than-normal profits for a time before rate reductions become effective.

"The use of depreciated cost for rate base purposes has the effect of reducing earnings as facilities grow older. For example, a pipeline which had charged depreciation at 3% per annum for 17 years would be allowed to earn (before interest) only half of original earnings. Depreciation charges are usually earmarked for debt amortization so that lower interest charges partly offset the reduction in earnings before interest. As a practical matter most pipelines and other utilities subject to regulation have pursued an aggressive expansion program which has been reflected in substantial net additions to plant accounts."

Discussing profit trends of natural gas distributing utilities and natural gas transporting utilities from 1939 to 1947, the study notes that the "expense ratios" shown in their profit trend study "indicate an exceptionally good control of costs."

"The declining trend of revenue per Mcf for each type of customer during these years increases the significance of the industry's performance in this regard," the study continues.

Good Cost Control

The study enumerates the following as the principal factors contributing to this good cost control:

(1) The industry's operations have increased to near capacity levels, a factor which is significant because virtually no increment in cost is attached to full utilization of facilities.

(2) Off-season and off-peak demand have increased which also contributes to economy of operation.

(3) Payrolls comprise only 13% of revenues compared with 20% for electric utilities. Taxes are also lower, 13% vs. 17%.

(4) Distributing companies are protected by contracts which control the cost of purchased gas, and transporting companies operate between purchase contracts fixing the cost of gas at the well and selling contracts with distributors.

(5) Addition of storage facilities has increased the winter peak capacity with a relatively small investment.

(6) Most pipelines are so designed that their capacity can be increased by the addition of compressor facilities or by the looping of part of the line with parallel pipe. This additional capacity entails only a small outlay in most cases. Gas distributing companies are also usually able to handle additional gas volume with only minor adjustments in facilities.

Quality Investment

Discussing the investment position of transporting companies, the study notes that they "constitute a high quality investment medium because of the excellent growth potentialities and well protected position in the event of business depression."

"The high percentage of residential load," it continues, "combined with the strong competitive fuel position make any substantial decline in natural gas consumption unlikely. The more recently negotiated contracts with distributing companies include a 'take or pay' provision which further strengthens the pipelines' protection. In the face of rising corporate taxation, the limitation of earnings to 6 to 6½% on capital *after taxes* becomes increasingly significant."

The fact that most pipeline companies have been financed very largely with borrowed capital is attributed in the study to the fact that operating profits are relatively inflexible and because allowable earnings on invested capital are limited.

Capital Ratios

"The newer pipelines particularly," the bank continues, "have resorted heavily to borrowed capital, being assisted in this by low money rates. Approximately 75% of total capitalization of these newer companies is represented by debt, with preferred stock in some cases accounting for another 10%. When this is compared with the traditional capitalization ratio of electric utility companies of 50% debt, 25% preferred stock and 25% common stock, the greater leverage of the gas pipeline companies is apparent."

The study concludes with the thought that stocks which offer the best market appreciation prospects are believed to be those which qualify on the following points:

Pipelines:

(1) Companies whose earnings are expected to rise substantially as the result of expansion under way, the financing of which is largely completed.

(2) Companies with important owned gas reserves which would add materially to earnings if divested from pipeline operations or if legislative relief of the present regulation of such properties were obtained.

(3) Companies with a wide profit margin.

(4) Companies with low cost gas purchase contracts and low cost pipeline facilities in comparison with competing pipelines.

Distributing Companies:

(1) Companies with market area facing rapid growth of natural gas use especially for residential house heating.

(2) Companies able to obtain sufficient industrial load to smooth out seasonal demand.

(3) Companies operating in areas where there are prospects of pipelines being built to supply future requirements.

(4) Companies with ample storage facilities in use or to be acquired.

(5) Companies with a low debt ratio.

(6) Companies able to expand distribution appreciably without substantial capital expenditures.

In a message accompanying the study, an officer of the Empire Trust Co. writes:

"The growth of this great industry, which is closely allied to the oil industry, has been as silent and efficient as natural gas itself."

Metropolitan Main Replacement

Problems in Designing and Constructing A New Area Distribution System

By F. M. PARTRIDGE and R. D. POMEROY

1. Design

AT best, the problems encountered in maintaining a gas distribution system in a metropolitan business district are difficult because of congestion of both underground structures and surface traffic. When such problems are aggravated by advanced age and poor condition of mains and services and by the fact that the system is actually composed of a number of parallel systems operating at different pressures, the maintenance job becomes more difficult.

Such was the situation in the downtown business district of Los Angeles which led to the adoption in 1946 of a long-range program for the design and construction of a new distribution system for the area. As is probably true in many cases, this portion of the Southern California Gas Co.'s distribution system, as it existed in 1946, could more accurately have been termed an "accumulation of gas pipes" rather than a "designed distribution system," and was the result of the merging of several gas companies which had originally supplied the area.

Leakage Problem

As the system had advanced in age, the location and repair of leaks had become an increasingly difficult problem. The conversion to natural gas in 1925 brought on the seemingly inevitable joint leakage in cast iron mains, while soil corrosion, aggravated by electrolysis from stray electrical currents, further increased the leakage problem. All of the mains were old and locating the source of leakage became increasingly difficult because of the multiple paralleling systems.

Design work was completed during the latter part of 1946 and construction and installation of the new system was completed during 1947 and 1948 on a 1½ square mile section of the central business district bounded by Figueroa St. on the west, San Pedro St. on the east, Pico Blvd. on the south, and Temple St. on the north. Completion of this project included the installation of approximately 150,000 ft of 8-, 6-, and 4-in. mains and the retirement of 266,000 ft of main which ranged in size from 1¼- to 30-in. and in age from 20 to 75 years.

The first step in the design procedure was the determination of the existing loads on the systems and the preparation of an estimate of anticipated future loads. The types of consumers were broken down into two groups and considered separately:

1. As a basis for determining the domestic and commercial loads, a comprehensive load survey made in 1937 was used and adjusted according to usage as shown by current meter book totals. In 1937, the monthly gas consumption for each meter in the district had been tabulated and divided by a load factor to obtain a safe figure for the hourly load. This load factor was determined by a study of peak-hour plant sendouts for a number of winter months.

2. An individual record is kept in the engineering department of all consumers with a connected load of 500 cu ft per hour or more. These loads were plotted on the maps used for distribution design and combined with the domestic and commercial loads for use in designing the system.

Inasmuch as there were both high-pressure and low-pressure consumers on most of the streets in the district, it was apparent that low-pressure distribution alone was not practical, as an increasing number of consumers require a delivery pressure higher than the standard 8-in. wc for operating boilers, furnaces, etc. An economic comparison between a plan of installing and maintaining a separate low-pressure system as against a plan of converting the low-pressure services to high pressure by the installation of house-type regulators proved the soundness of building a single high-pressure distribution system. The advantages of high-pressure operation with its attendant flexibility and smaller pipe sizes were compared with low-pressure operation with its lower leakage and simplified maintenance. After consideration of the factors involved, the design was based on an operating pressure of 15 psi at the regulator station outlets.

Pressure Drop

It was found that gas distribution systems have been designed utilizing pressure drops as high as ⅓ to ½ of the initial pressure, thus making possible the use of smaller mains, but this would not permit the addition of future large loads. By the use of very large mains, the pressure drop could be practically eliminated. It was apparent that some pressure drop should be determined that would permit the use of economical sizes of pipe and still be adequate for possible increased future loads. A pressure drop of ½ psi in the feeder mains and 1½ psi in the distributor mains was therefore adopted as a guide in this design.

The size of the feeder mains, the number and spacing of regulator stations, and the allowable pressure drop were closely related. In our problem,

Presented at the Pacific Coast Gas Assn. technical section distribution conference, Los Angeles, April 7-8. The authors are distribution engineers for Southern California Gas Co., Los Angeles.

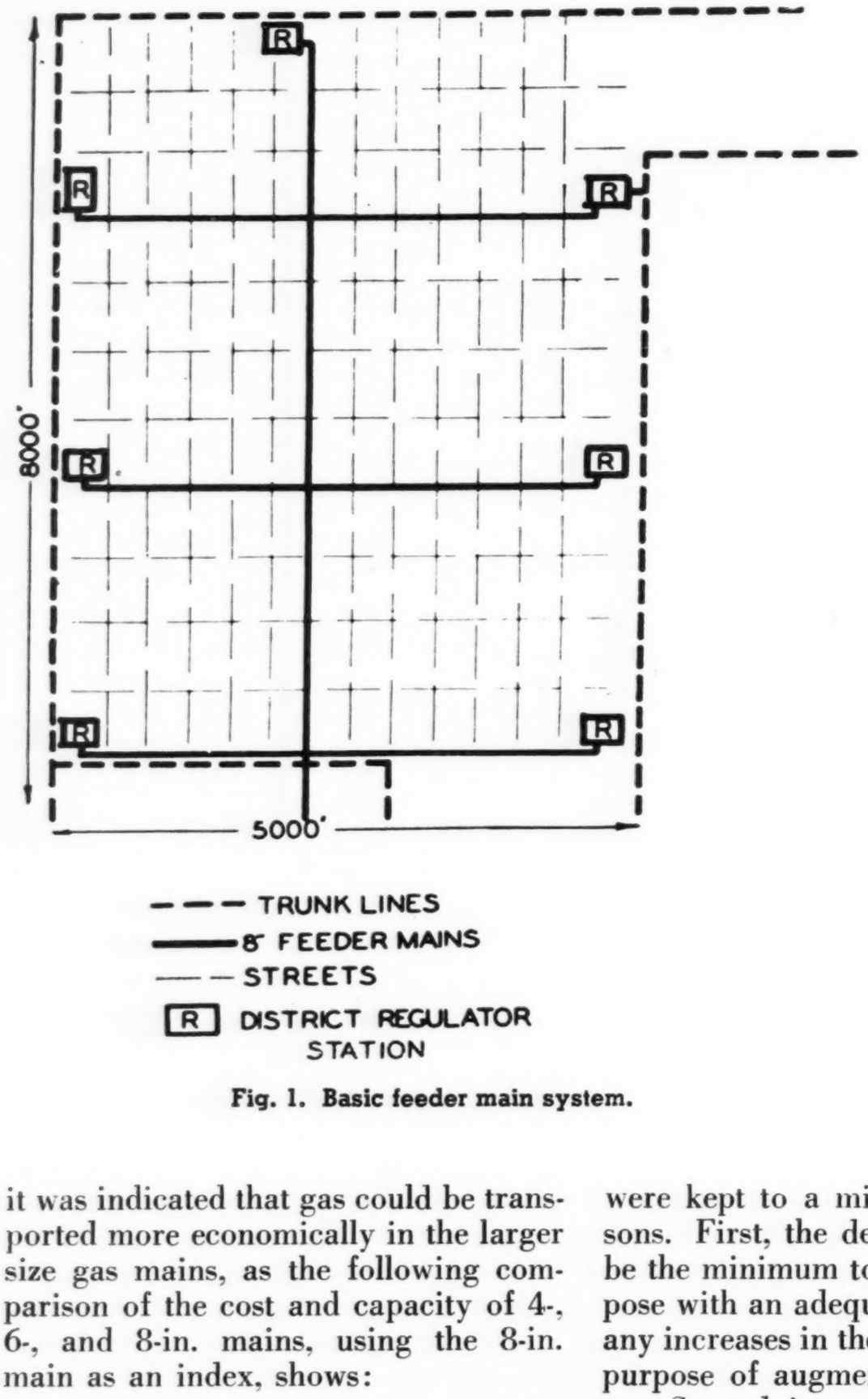


Fig. 1. Basic feeder main system.

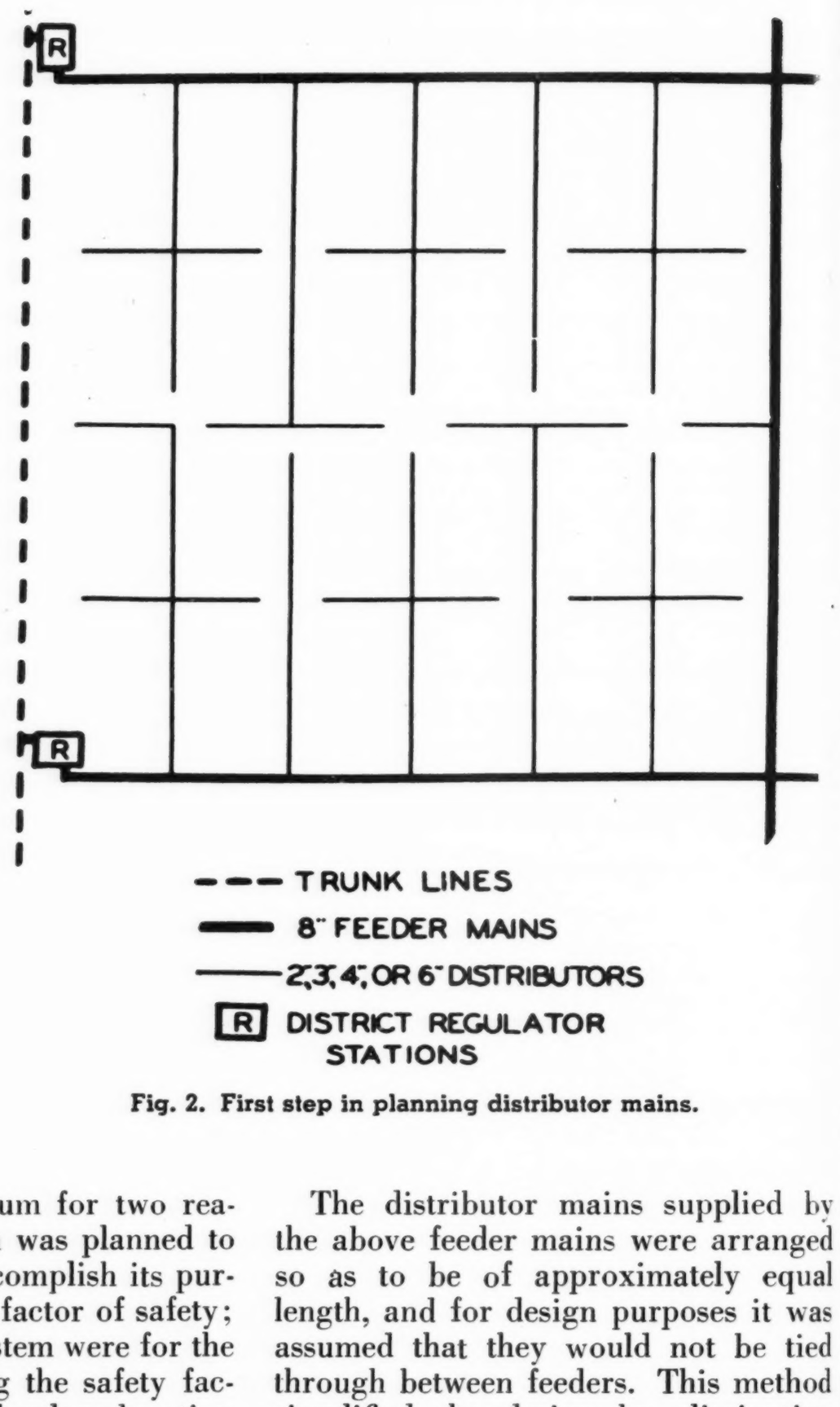


Fig. 2. First step in planning distributor mains.

it was indicated that gas could be transported more economically in the larger size gas mains, as the following comparison of the cost and capacity of 4-, 6-, and 8-in. mains, using the 8-in. main as an index, shows:

Size	*Capacity*	*Cost*
4-in.	17%	78%
6-in.	50%	87%
8-in.	100%	100%

The high ratio of labor cost to total cost in this congested district makes installation of larger mains economically more favorable. For this reason it was decided to use 8-in. feeder mains.

Regulator Stations

The allowable pressure drop used and the size of feeder mains controlled the number and size of regulator stations. By using 8-in. feeders and ½ lb pressure drop, it was determined that the regulator stations should be spaced from 3200 to 5000 ft apart in this district, depending on the concentration of loads. This resulted in a design load for each station ranging from 100,000 to 175,000 cu ft per peak hour. The regulators were sized so as to have sufficient capacity to meet peak loads with a 20 psi inlet and a 15 psi outlet pressure. Each regulator station was equipped with a dust filter.

In general, the distributor main sizes were kept to a minimum for two reasons. First, the design was planned to be the minimum to accomplish its purpose with an adequate factor of safety; any increases in the system were for the purpose of augmenting the safety factor. Second, in a well-developed section such as the one under consideration, there is always a possibility of very large consumers, such as hotels, apartments, or business buildings, replacing existing small consumers at locations which are not now known. It was proposed that such such consumers be supplied by laying a larger main, if necessary, when the need arises rather than attempting to provide on every street large mains which may never be utilized economically.

With the factors outlined above in mind, the next step was to lay out the distribution system. The plan adopted for the district was based upon the feeder main system shown in *Fig. 1*. These 8-in. feeders were generally placed at four-block intervals connecting the outlet of the regulator stations in accordance with the factors developed above.

In laying out the feeder and regulator system, it was planned that the system would still operate wtih one regulator out of service. This condition could occur during emergency operations or during a planned shutdown.

The distributor mains supplied by the above feeder mains were arranged so as to be of approximately equal length, and for design purposes it was assumed that they would not be tied through between feeders. This method simplified the design by eliminating tedious network calculations which were not justified in this area where future loads could not be foreseen. *Fig. 2* shows the first step in laying out the design. The distributor mains shown are generally 2-, 3-, 4-, or 6-in. and are approximately 1300 ft long.

Modifications

After the design of the system for the district was completed, two modifications were made to increase the operating flexibility of the system and provide a larger factor of safety in meeting future peak loads. These were:

1. A minimum 4-in. size for distributor mains was adopted.
2. A large number of distributor mains were tied together between feeders to provide two or more sources of supply and to take advantage of diversity of loads among a greater number of consumers.

The importance of providing an adequate number of valves for isolating small sections of the system during emergencies was forcefully impressed on us by an incident which occurred

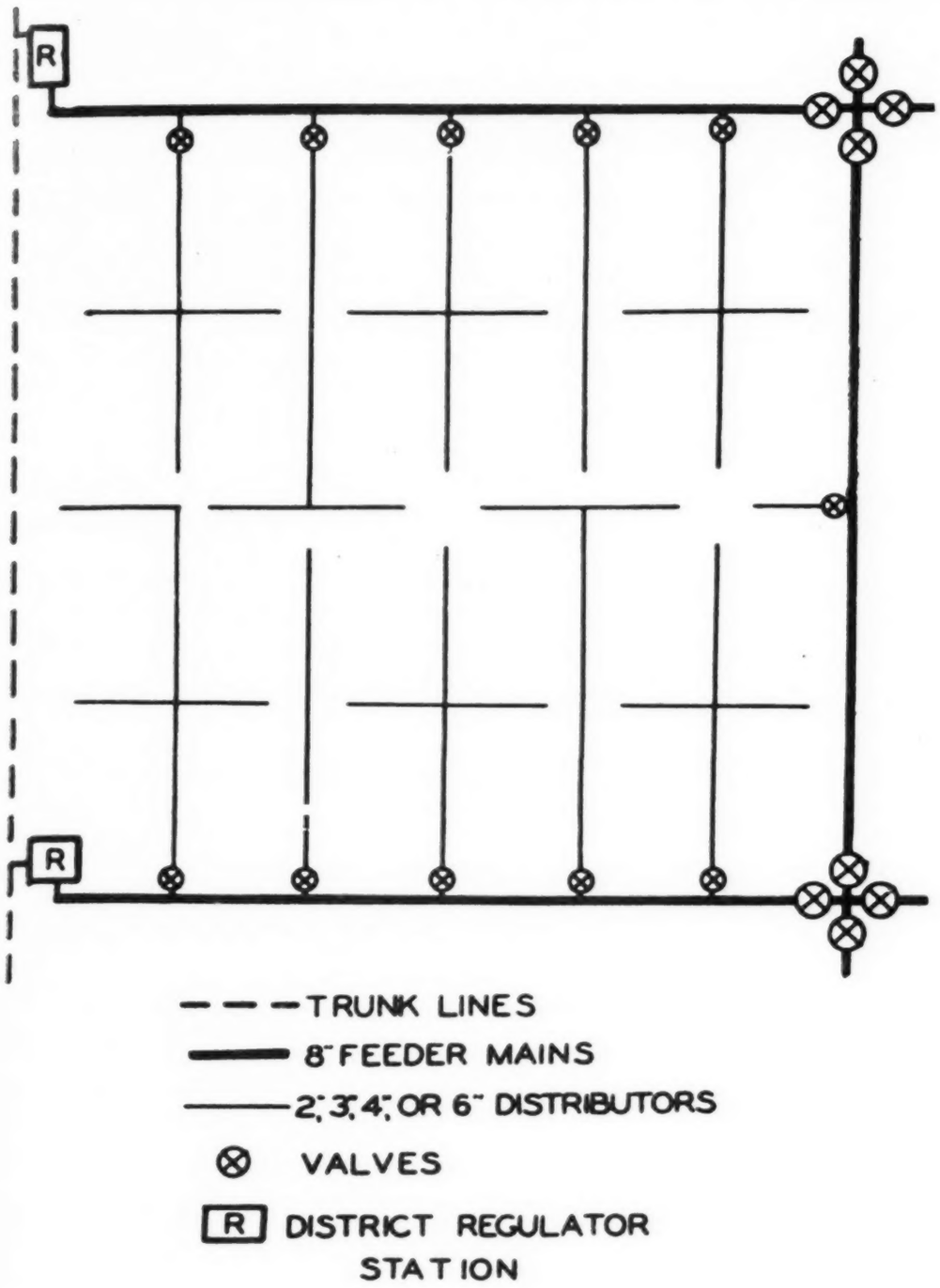


Fig. 3. Layout of valves for emergency shutdown.

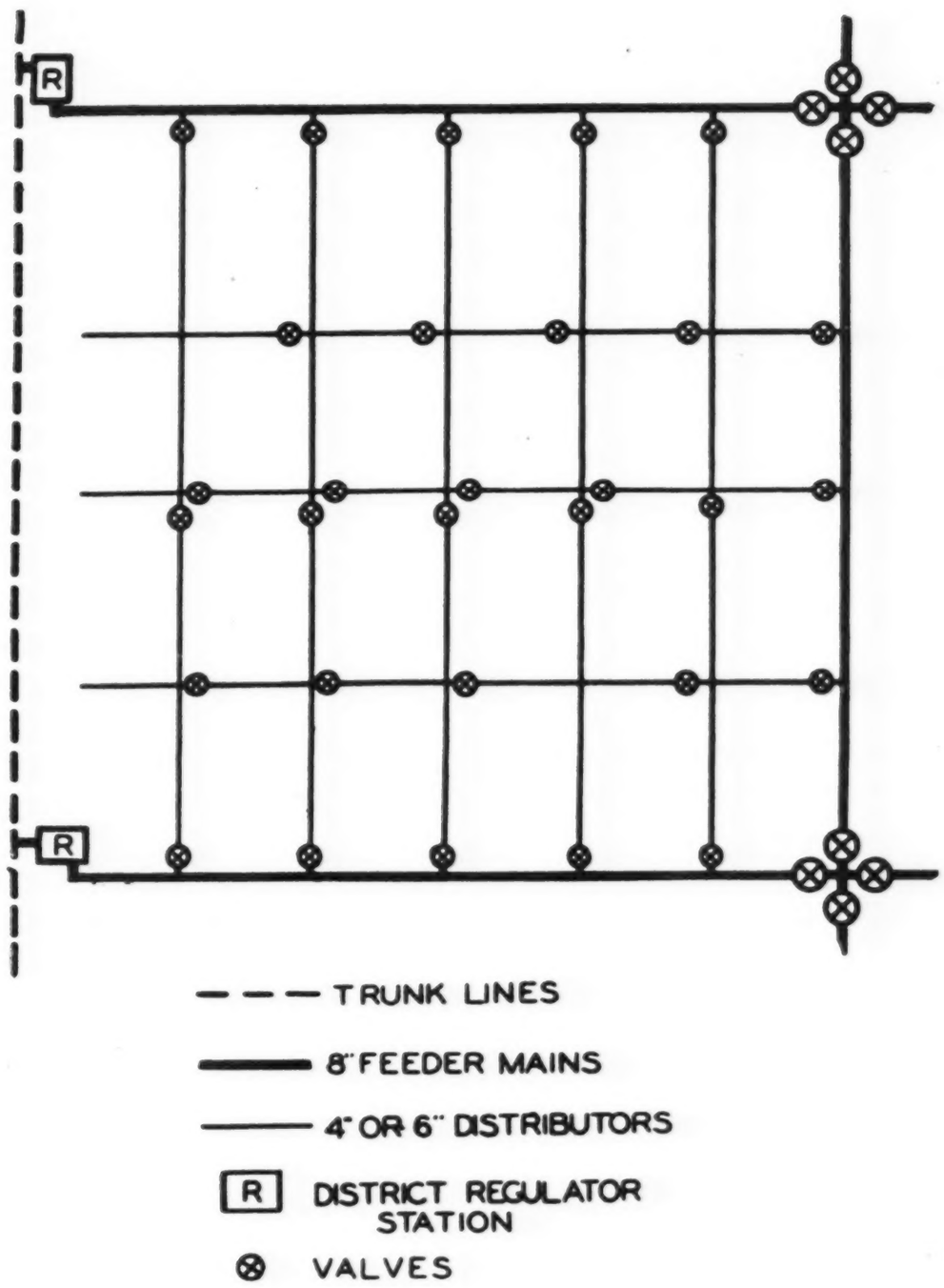


Fig. 4. Plan for installation of isolation valves.

at about the time this program was started. In this case, a short lateral from our 9 lb system was broken by an excavating machine. The break, unfortunately, was in front of one of the local newspaper offices and necessitated suspension of the paper's operation for some time. Because of the lack of isolation valves in the area, the shutdown of more than 1300 consumers, including the city emergency hospital, would have been required in order to stop the gas flow with existing valves, and a decision was made to install 8-in. pressure control fittings near the break, an operation which required approximately two hours to complete.

In the interest of facilitating emergency shutdowns in case of an unforeseen incident, such as that mentioned, valves were included in the design at intersections of feeder mains and at each point of takeoff of a distributor main, as shown in *Fig. 3*.

The general plan followed was to place valves:

1. At each point of takeoff from a feeder main.
2. One valve in each block in east and west streets.
3. One valve approximately midway between feeder mains on north and south streets.

Fig. 4 shows a section of the distribution system with the isolation valves shown.

2. Planning and Construction

Although the reconstruction of the distribution system in metropolitan Los Angeles was conceived as an overall plan, it was executed as an integrated program of individual projects, i.e., the reconstruction of mains and services in each street was a project in itself.

The size of the program, the complexity of the gas supply, and the fact that eight construction crews were to operate simultaneously called for very definite scheduling of work in advance of all other preparations. We found that factors governing a workable schedule included (1) gas supply to the new and old distribution systems, (2) economical utilization of manpower and equipment, (3) restrictions imposed by the city's traffic bureau, (4) municipal street maintenance programs, and (5) proposed work schedules of other utilities.

Insuring Gas Supply

Since the replacement of several distinct distribution systems with one system was involved, it was necessary to schedule the work so that each system had an adequate supply of gas at all times. By operating the new system at a pressure higher than its design pressure, and by performing the work in the off-peak season, it was found that portions of the system could be left partially connected during the construction period, thus adding flexibility to the scheduling.

In cases where an existing feeder main was required for purposes of gas supply until the end of the program, all of the services were removed therefrom in conjunction with the new main installation, and the feeder main was left in service until the conclusion of the program.

Working Out Details

Details of each main construction project were planned in advance with the aid of the construction supervisor. In planning this program, particular care was exercised in providing for the tie-in of other mains to be made at a later point in the program, and to see that adequate clearance from foreign substructures was maintained, inasmuch as our maintenance program had been handicapped in the past because

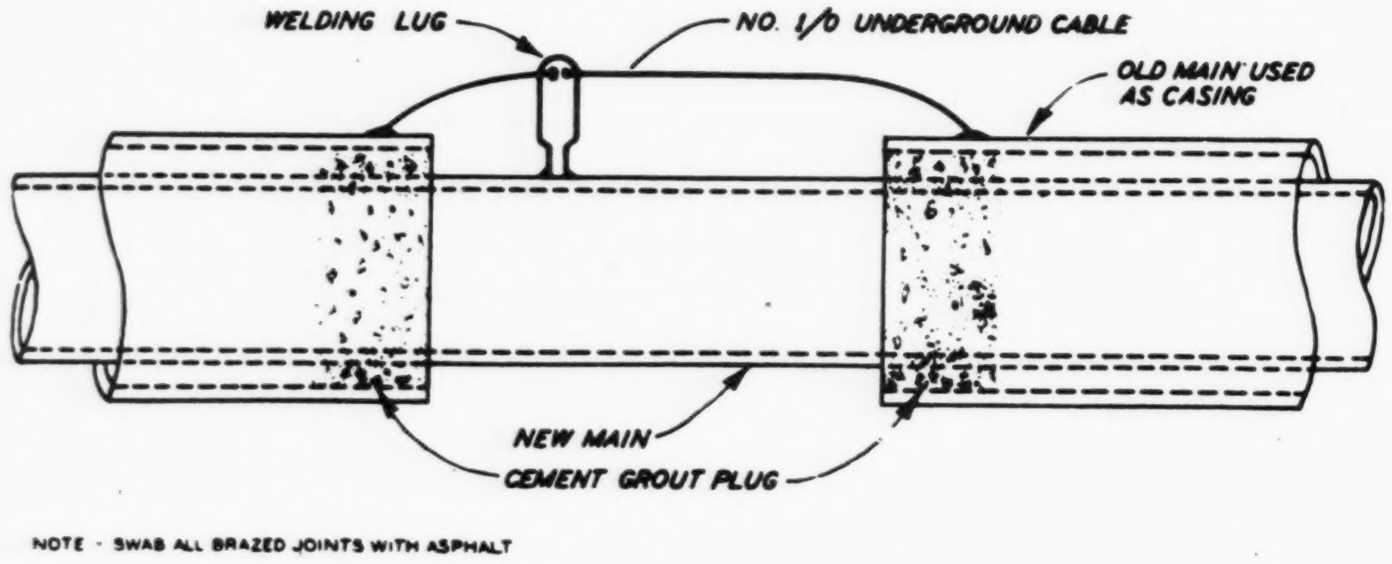

WELDING LUG
NO. 1/0 UNDERGROUND CABLE
OLD MAIN USED AS CASING
NEW MAIN
CEMENT GROUT PLUG
NOTE - SWAB ALL BRAZED JOINTS WITH ASPHALT

Fig. 5. Method of bonding new main to casing.

of mains lying within foreign vaults. This planning program permitted early ordering and stockpiling of materials, with a resultant smoother flow of materials to the field during construction.

It was not until 1932 that the use of welded steel pipe, standard service tees, welded riser bends, and an effective wrapping had become universal in installing services in the territory served by our company. In view of this, it was decided to replace all services laid prior to that time in order that the distribution system, both mains and services, would be constructed in its entirety according to present day standards, precluding the probability of additional maintenance work for a number of years. Since the new distribution system was operating at a higher pressure than the old one, generally, the existing services could be replaced with smaller pipe. In many cases, advantage was taken of this situation to pull small diameter soft drawn copper tubing through the existing larger sized steel services as long as the services were free of sharp horizontal or vertical bends.

Relocating Meters

Since many of the existing meter set assemblies were in undesirable locations, such as under stairs, high on walls, in washrooms, etc., each meter set assembly was field checked for accessibility and compliance with city ordinances and company standard practices. The correction of many of the undesirable conditions, together with adherence to a policy of keeping high-pressure gas outside a building whereever possible, necessitated the alteration and extension of many houselines and in some cases required curb meter installations. This houseline alteration work was contracted to licensed plumbers.

Where an existing main was found to be of sufficient size and in a desirable location, it was used as a casing for the new main. This method of installation proved to be more economical, as it required a minimum of trenching, thus saving $1.40 per lineal foot of trench in pavement replacement charges alone. It was possible to insert as much as 2000 ft of new 4-in. steel pipe inside an old 6-in. cast iron main in one day and as much as 2500 ft of 4-in. steel pipe was installed inside an old 6-in. steel main with only 60 ft of open trench. We learned by experience to maintain an accurate log of pipe inserted in order that obstructions encountered during the installing operation could be located easily without unnecessary excavation. In addition to the economy of this method of installation, it created a minimum of interference with the flow of traffic and inconvenience to the public and adjacent property owners.

Leak Detection Plan

Whenever the new main was installed inside the old main, a short section of the casing was removed at each service connection to the new main. Additional cuts were made so that the casing was broken at intervals of not more than 200 ft. This will be helpful in the location of future leakage. At each cut, the ends of the casing were filled with a cement grout and the casing bonded to the new main to provide a better path for the drainage of electrical currents back to their sources. A welding lug was welded to the new main and No. 1/0 underground cable was brazed to each end of the casing and to the welding lug. (See *Fig. 5.*)

All mains installed in casing were coated with grease which served both as a lubricant and as a protection against corrosion, while standard wrapping was used on all sections of the new mains not actually in the casing. Abandoned mains were also cut every 200 ft and the ends plugged with cement grout. After each new string of pipe was welded onto the pipe already inserted, the entire length of new pipe was air tested and all welds soap tested.

The new pipe was actually inserted in the casing by a winch-driven cable pulling on the new pipe through a system of block and tackle anchored to the old main. (See *Fig. 6.*)

Liaison Between Crews

As construction was generally carried on in four to six separate locations simultaneously, it was necessary to maintain a close liaison between all the construction crews in order that a constant check could be maintained on gas supply to individual mains. As an aid in maintaining this liaison, the progress of work, both installation and retirement of mains, was recorded daily in detail on the operating maps. These maps were referred to each morning to insure that no retirement planned for the day would leave a dead end main without a source of supply or any main without an adequate gas supply. It was also imperative that the operating maps be maintained on a current basis in order that the information would be available to persons not cognizant of the detailed progress of the reconstruction program and who would be called upon to direct operations in case of an emergency.

Adjustment of working hours to off-peak traffic hours, limited parking space for equipment, and limited space for material stockpiling and spoil banks were some of the many problems encountered. However, it should not be construed that these were problems peculiar to the Los Angeles area; rather they were factors which would affect the successful execution of a major main replacement program in any metropolitan area.

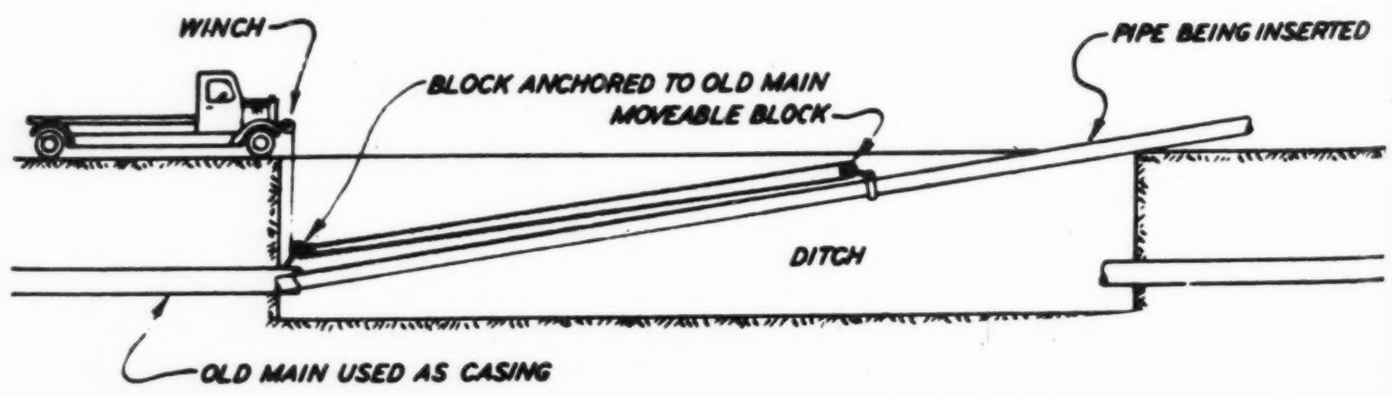
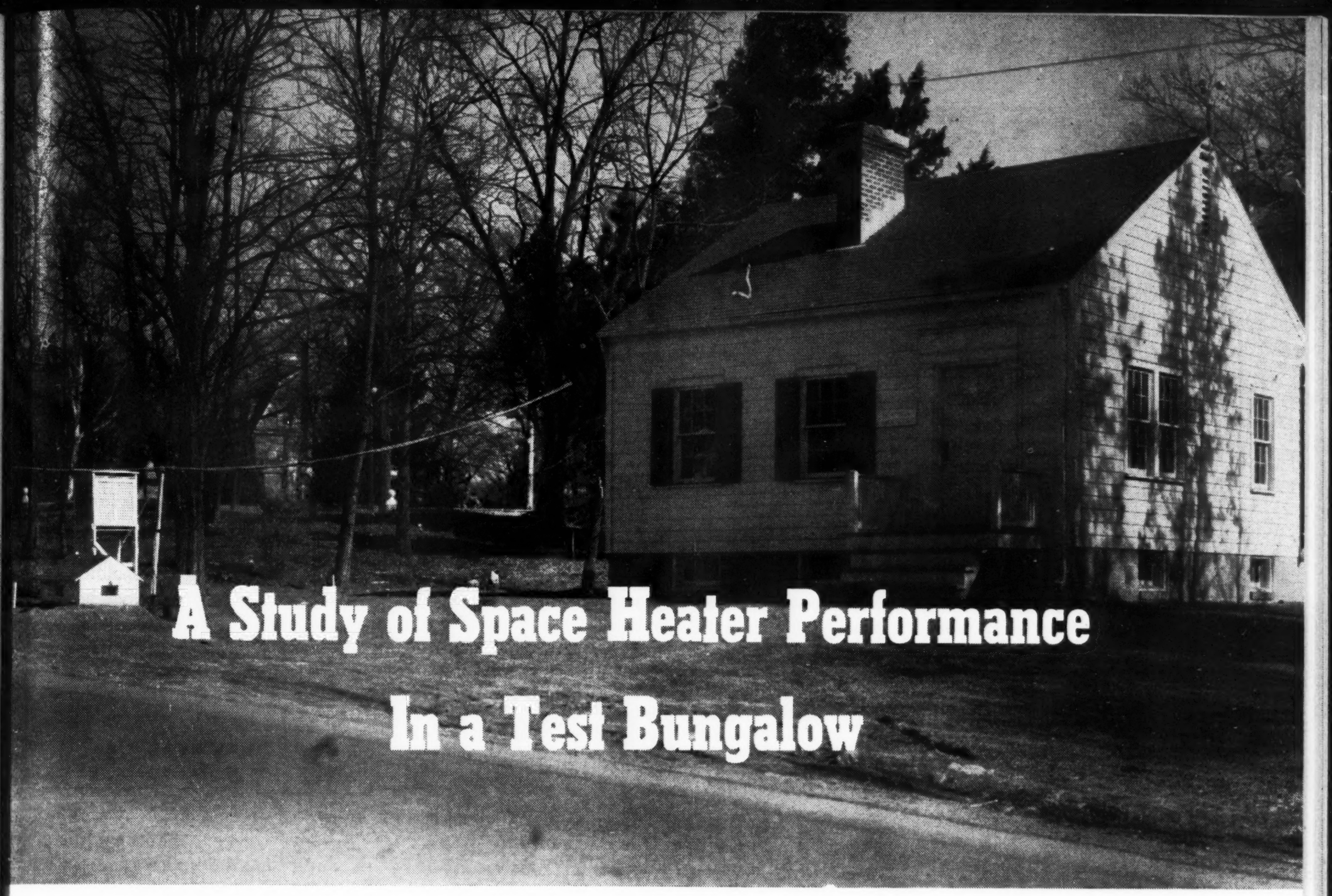


Fig. 6. Method of installing new pipe in old main used as casing.



A Study of Space Heater Performance In a Test Bungalow

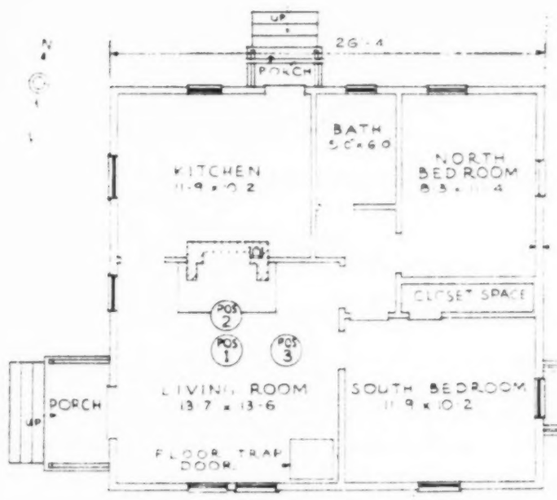


Fig. 1, house, and 2, floor plan, showing heater positions 1, 2, 3, and alternate door to south bedroom open. Position 4 was in temporary opening in living room wall immediately east of fireplace.

Findings of tests made to determine efficacy and limitations of space heaters, and the effect of fans, jackets, and under-floor plenums on performance. Although coal heaters were used, findings are applicable to gas heaters as well.

RADIANT and jacketed space heaters[1] are widely used in small houses in both federal and other housing projects. Because of the dearth of data concerning the heating characteristics of this type of heating device, an investigation of the performance of space heaters has been completed by the Building Technology Division of the National Bureau of Standards.

The bureau's tests were conducted in a four-room "test bungalow" completely enclosed by an insulated outer shell so that the temperature might be varied to simulate any condition throughout the United States. This bungalow has been in use for a number of years at the bureau of research in heat transfer phenomena in small houses.

Objectives of the present studies[2] were a comparison of the temperatures produced by radiant and jacketed heaters in different positions; a comparison of effects of different heater jackets; recommendations regarding the limitations of space-heater use; and a determination of whether or not unattached fans, transoms over interior connecting doorways, and underfloor plenums improve conditions in a home heated by a space heater.

Space heaters are more widely used for house heating in the United States than any other single type of heating equipment. According to the Housing Census of the Bureau of Census for 1940. 35% of all urban homes and 63% of all rural homes were heated by space heaters of one kind or another. Such heaters are manufactured for burning the common types of fuel such as wood, coal, oil or gas. Factors responsible for their widespread use include low first cost, efficiency, ease of installation, low fuel consumption, and provision of a zone of comfort by radiation near the heater.

The first cost of a space heater is much less than that of a central heating plant, and for efficiency of fuel utilization many space heaters compare favorably with central heating plants; they also have a great advantage over open fireplaces. These considerations tend to justify claims made by the manufacturers that space heaters furnish the cheapest heat in the world and are responsible, at least in part, for the predominant use of space heaters in small houses.

One of the principal disadvantages of space heaters—other than those using oil or gas—is the inconvenience of bringing in fuel and removing ashes,

[1]For technical purposes a space heater has been defined as an "above-the-floor device for the direct heating of the space in which the device is located without the use of external pipes or ducts as integral parts of such heating device." *(See Flue-Connected Oil-Burning Space Heaters*, NBS Commercial Standard CS101-43). Space heaters have long been known as heating stoves in this country, to distinguish them from cooking stoves.

[2]For further technical details, see *Temperature Distribution in a Test Bungalow With Some Radiant and Jacketed Space Heaters*, NBS Building Materials and Structures Report BMS114. Available only from Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., at 25 cents per copy.

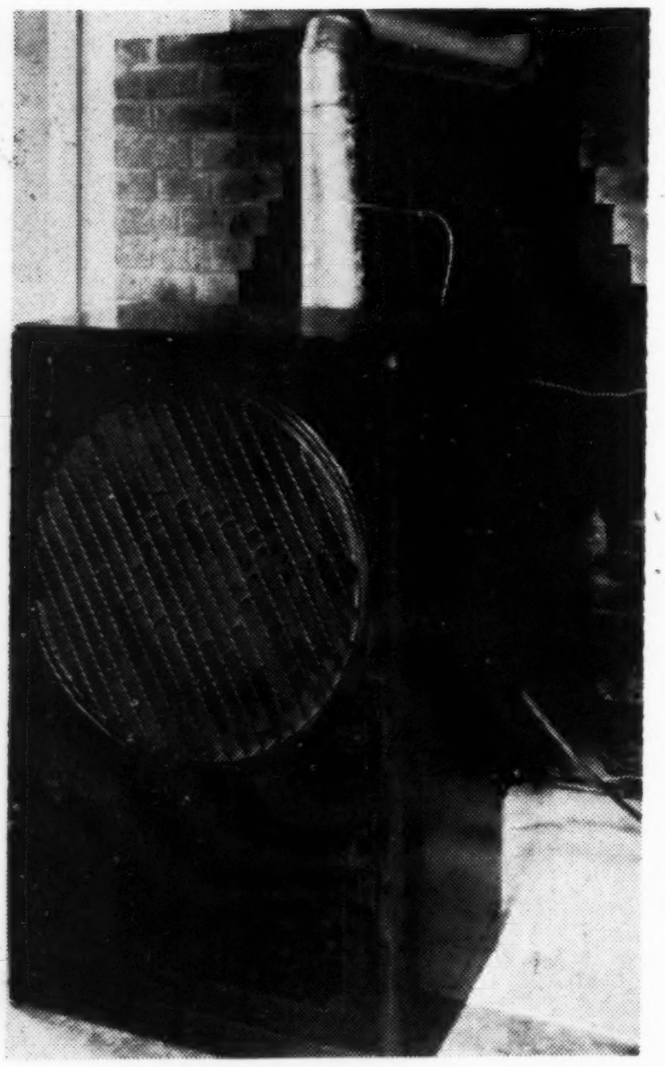


Fig. 3. Gas-fired space heater with attached circulating fan is shown in position 2 in the living room.

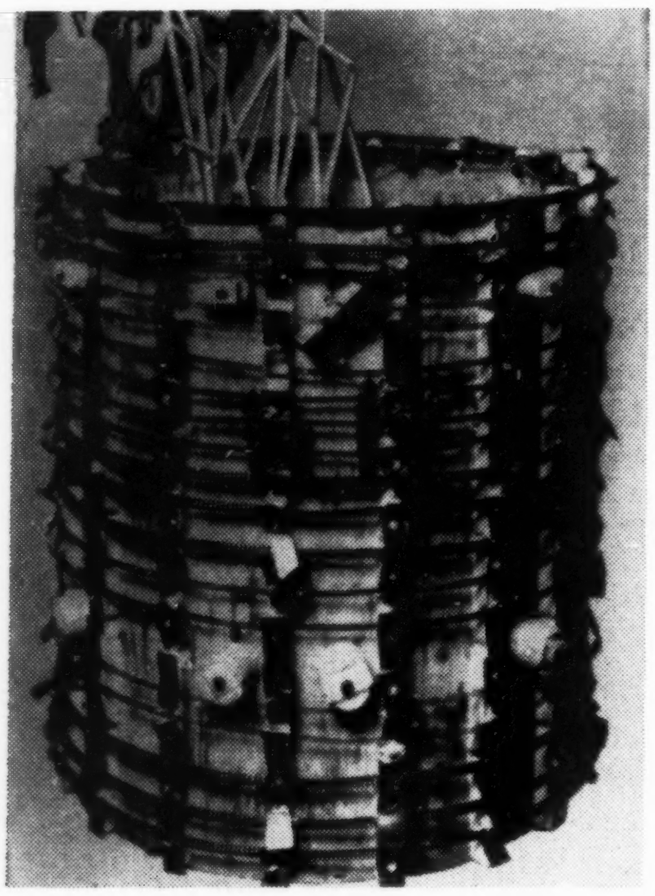


Fig. 4. Electric heating element used for tests with heaters A and B.

since both operations create dust. Other disadvantages are the loss of usable space in the living quarters and the lack of "even heat" or uniform temperatures throughout the house. For these reasons, other home-heating methods, such as steam, warm-air, or hot-water systems, are sometimes preferred.

The test bungalow at the bureau is similar to House B, described in FHA Technical Bulletin No. 4, "Principles of Planning Small Houses." (See *Fig. 1* and *2.*) It has four rooms and bath on one floor with a small hallway near the middle of the structure. Various arrangements were used during the space-heater tests. The outside walls of the bungalow are conventional in construction and consist of 2- by 4-in. studding with sheathing and lap siding on the outside, separated by a layer of building paper, and ½-in. gypsum board on the inside.

The walls are not insulated nor are the windows and doors weather-stripped. The bungalow has a double floor; both subfloor and finish floor are of 1-in. pine with building paper laid between in the conventional manner. The ceiling, which is insulated with 3⅝-in. rock wool batts, consists of ¼-in. plywood supported by a framework of 2- by 4-in. timbers. The windows, of wooden frames and sashes, are double hung, with the exception of those in the bathroom and kitchen.

Two coal-fired radiant space heaters of the magazine type were chosen for the bureau's temperature distribution tests. Designated as heaters A and B, these were of the size and capacity shown in *Table 1.*

Gas Data

The third specimen, heater C, was a coal heater of the surface-fired type with a cast-iron jacket. Data were also obtained on commercial models of a gas-fired *(Fig. 3)* and an oil-fired space heater.

Heater A was fitted successively with four sheet-metal jackets spaced at different distances from the heating surface. Each jacket was cylindrical in shape, conforming to the body of the heater, and extended from the level of the ash pit to that of the lower edge of the dome section. The jackets were spaced at the following distances from the heating surface: Jacket 1, 2½ in.; 2, 4 in.; 3, 6 in.: and 4, 4 in. with an inner liner spaced 1 in. from the jacket.

For test purposes, the smoke pipes and firebrick linings were removed from heaters A and B. Heat was supplied to each by means of a cylindrical, electric-heating element fitted into the combustion chamber, thus permitting better control of the heater and more accurate measurement of the energy supplied. The electric-heating element consisted of nichrome wire coils wound in horizontal turns around a 16-in. cylinder that was separated from the firebox wall by a 1-in. air space. *(Fig. 4.)* The heat output—equal to the electric energy input—was measured with calibrated watt-hour meters graduated in divisions of 10 watt-hours. By placing the jacketed cast-iron heater C on a platform scale and firing with anthracite, fuel consumption was determined very closely by the decrease in weight during test. Flue-gas losses were determined from flue-gas temperature and analysis.

Temperatures in the bungalow during the tests were measured by means of thermocouples covered with cork insulation and supported at five different elevations above the floor, namely, 2, 30, 60, 78, and 94 in. Five such sets of thermocouples were used in each of the four large rooms, one at the center of the room and one midway between the center and each corner. In the living room the center string of thermocouples, being too near the heater, was moved toward the double window to a position 36 in. from the wall. Three strings were used in the bathroom, one at the center of the room and one midway between the center and each of the walls along the longer axis of the room.

Heater A with each of the four jackets, heater B, and heater C were investigated in one or more of four positions: (1) At the intersection of the center lines of the fireplace and of the doorway between the living room and south bedroom; (2) on the center line of the fireplace and with the stove 30 in. from the north wall of the living room; (3) on the center line of the doorway between the living room and south bedroom and with the stove 28 in. from the east wall of the living room; and (4) in a central location provided by cutting a temporary opening in the living room partition on the north side adjacent to the hallway.

All heaters were tested with natural circulation of the air over the heating surface and in the living space. In addition some tests were made with all except heater B by using a 12-in., four-bladed fan in the vicinity of the heaters to force the warmed air toward adjoining rooms. Best results were obtained

TABLE I. SPECIFICATIONS OF TEST HEATERS

Heater	Nominal coal capacity	Grate area	Body diameter	Over-all height
	Lb	*Sq. In.*	*In.*	*In.*
A	100	177	19	42
B	200	227	21	50

with the fan located on the fireplace mantel forcing warm air toward the hall.

It often happens that one room is too warm for comfort in the "living zone" (that is, the space between 2 and 60 in. above the floor), whereas another room is too cold at some level. For these tests, therefore, the total temperature difference in the living zone is defined as the difference between the average temperature at the 60-in. level in the living room and the minimum average temperature at the 2-in. level in any room. This follows because the living room is always the warmest room. The total temperature difference reflects the ability of a heater to produce uniformity of temperature both vertically and horizontally in the entire house.

Based on the reactions of the personnel used as observers during these tests, a temperature of not less than 60° F at 2 in. above the floor, and a temperature of not more than 85° F at 60 in. above the floor were considered as providing minimum acceptable comfort. The average radius of the area around each space heater that complied with these temperature requirements was determined for all tests. This radius ranged from 7 ft when the outside temperature was 0° F, to 35 ft for an outside temperature of 50° F.

Conclusions

The investigation has established several general conclusions. The maximum total temperature differences produced in the living zone of a house by a space heater are almost directly proportional to the heat output. Furthermore the radius of the comfort zone decreases as the outside temperature decreases. Although the conditions for acceptable comfort as here defined are based on the reactions of only a few persons, the data indicate the temperatures and the radii of the zones of comfort likely to occur when houses similar to the test bungalow (in size, construction, and degree of insulation) are warmed by space heaters.

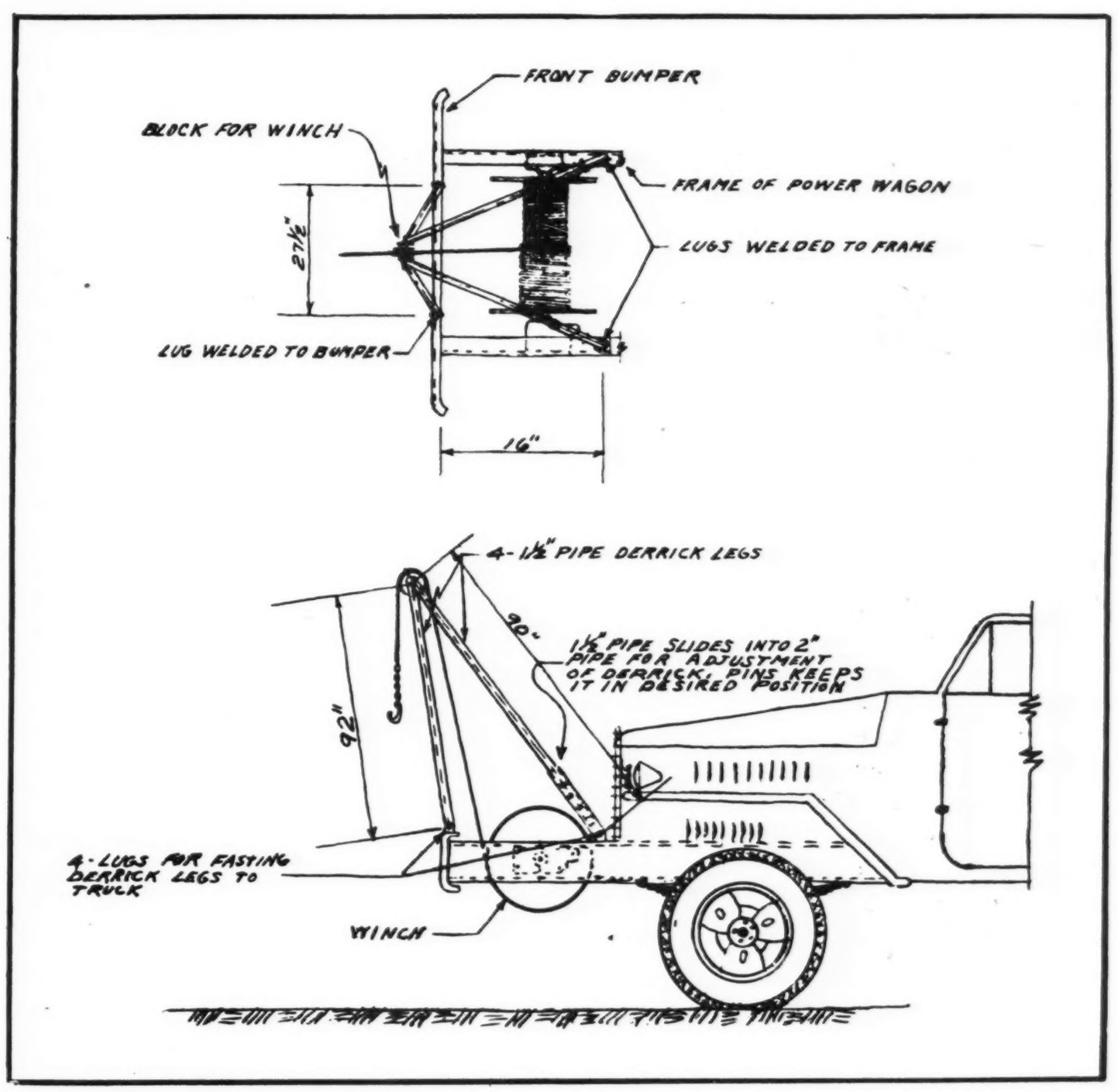
Houses with insulation in the walls or with storm windows and weatherstripping would have a lower heat loss per unit area than the test bungalow and could, therefore, be warmed at a lower outside temperature without exceeding a given temperature difference in the living zone. Structures larger than the test bungalow could be warmed by a space heater for moderate outside temperatures. In producing temperature distributions approaching uniformity among the several rooms of the test bungalow, the devices tested fall into the following order of decreasing merit: (1) Jacketed heater at approximate center of house; (2) radiant heater at approximate center of house; (3) jacketed heater in living room; (4) radiant heater in living room.

Temperature Zones

Bureau tests in general show that a radiant heater, in any of the four positions described, produces slightly lower temperature differences between the 2- and 60-in. levels than a jacketed heater, and when located near the center of the house, produces a given temperature condition in the living zone with 15 to 20% less heat output than a jacketed heater. A double-walled heater jacket is more effective than any of the single jackets in reducing the temperature difference between rooms in the test bungalow. For single jackets, the width of the air space does not materially affect the temperature distribution for widths from 2½ to 6 in.

In addition, the variation in size and height of space heaters used for heating residences has a slight effect on the temperature in the room containing the heater but no significant effect on the temperatures in other rooms of the house. The use of open transoms over doorways connecting adjacent rooms augments the flow of heat to the colder room, although the effect becomes increasingly less at the lower levels in the colder room.

It was also shown that the heat distribution in the house could be improved by the use of a desk fan placed to receive warmed air from the heater and blow it toward the door or an opening to another room. This effect varies with such factors as the size and power of the fan and its proximity to the heater. In fact, results of earlier space heater tests using integral fans have indicated that the unattached fan is as effective as the integral fan in improving the distribution of heat.



An Operating Idea: 4-Leg Truck Derrick

An invention of Clarence A. Fetty, Hope Natural Gas Co., Clarksburg, W. Va., this 4-leg derrick has proved successful in such operations as hanging gates, replacing single joints of pipe, and transporting material. It is installed on the front end of trucks equipped with a winch. It is attached to the truck by means of lugs welded to the bumper and frame. Made of 1½-in. pipe, it has two legs which slide into two short pieces of 2-in. pipe for adjustment purposes. Hope presented a prize to Mr. Fetty for the idea.

Colorimetric Test for Determining Mercaptan Odorants in Natural Gas

By D. L. WHITE and P. E. REICHARDT

Selecting A Method

AMONG the odorants normally employed in the odorization of natural gas are mixtures of mercaptans. The odorants are added to the gas stream in small quantities (on the order of 1.0 lb per million cu ft of gas), and the rate of addition must be controlled so as to maintain fairly uniform odorant concentrations in spite of widely varying gas flows. It is of importance to have some means of checking the concentration of odorant throughout the gas distribution system.

Exclusive

The method in general use for routine estimation of the concentration of mercaptan odorants consists of passing a definite quantity of natural gas under specified conditions through a test paper impregnated with a solution of copper oleate. Upon exposure of the test paper to sunlight or ultra-violet irradiation, the color of the paper changes from green to brown, the intensity of the brown color varying with the concentration of the mercaptan odorant. The color is then matched against a standard color chart.

Experience with this method has indicated much to be desired in the matter of reproducibility of results. This stems mainly from the disagreement among laboratory technicians in matching test papers against the standard color chart. In spite of the fact that the test requires little manipulation and time, and is nicely portable, it was felt that a procedure leading to more reliable results would be useful.

Attention was then turned toward modification of the most likely method for the determination of mercaptans in solution, to include absorption of the mercaptans from a gas stream. It was also necessary to expand the sensitivity so that relatively small concentrations (0.05 mgs. per cubic foot of gas) could be quickly determined. The colorimetric method developed is based on the procedures of Bond[1] and of Turk and Reid[2] which describe the preparation and use of copper alkyl phthalates for the determination of mercaptans.

[1] Bond, G. R., *Ind. Eng. Chem.*, Anal. Ed., 5, 257 (1933).
[2] Turk, Ernest, and Reid, E., Ibid., 11, 713 (1945).

The authors are chemists with the Washington (D.C.) Gas Light Co.

Procedure

The absorber and test solution must be perfectly dry before starting the test, since small amounts of water produce capacity in the butanol solution, leading to high results. Traces of calcium chloride in the copper butyl phthalate solution result in the formation of a yellow color, the presence of which invalidates the test. Calcium chloride therefore should not be used to dry the butanol.

Ten ml. of the copper butyl phthalate solution are added to the clean, dry absorber. The stopper is inserted in the absorber top and the outlet tube is connected to the wet test meter. The gas supply is introduced at the base of the absorber, using a suitable valve to regulate the flow of gas. Gas is passed through the absorber at a rate of 12 cu ft per hour until 3 cu ft of gas, measured at standard conditions, have been metered. In order to obtain the recommended gas rate, a pressure of from 1 to 2 lb psi is required. If tests are to be run where the available pressure is less than this amount, it will be necessary to use a small pump. The pump should be connected between the absorber and the meter in order to prevent the possible absorption of odorant by the pump lubricant.

Some butanol is evaporated during the test, the amount depending on the solution temperature. Fresh butanol is therefore added to the contents of the absorber to restore the original 10 ml. volume. If mercaptan odorant is present in the gas, a slight turbidity will be noticeable in the absorbing solution. The test solution is mixed by rotating the absorber, and is transferred to a matched colorimeter test tube. The tube is exposed for 20 min to ultra-violet light. The irradiation should produce a clear, green-blue solution. At this point, the sample should be compared by eye with a blank of the copper butyl phthalate solution, and if appreciable turbidity is observed, the sample should be discarded and a second test made. The tube is placed in the colorimeter and is matched against a blank of the blue-colored copper butyl phthalate solution. The intensity of the green-blue color is a measure of the mercaptan concentration, and results in terms of pounds of odorant per Mcf of gas may be determined from an appropriate calibration chart.

Evaluation

Absorber efficiency was determined by operating two absorbers, each containing 10 ml. of copper butyl phthalate, in series with various gases containing from 0.5 lb to 2.5 lb of odorant per MMcf. In all cases, no color change was noted in the second absorber. It is realized that absorber efficiency determined on this basis may be in error because of small quantities of odorant passing through both absorbers without effecting measurable color change. However, hundreds of tests conducted on natural gas transmission lines odorized at known concentrations, have further established the completeness of odorant absorption.

It is quite important that the copper butyl phthalate test solutions be irradiated by ultra-violet light under conditions which may be reproduced. Variation in the distance of the U-V source from the solution gives varying results of color development with a fixed time of exposure. Variations of considerable magnitude may also result from irradiating the solution in positions to either side of the axis of the U-V lamp. All of the work was done with the solution exposed 6 in. from the lamp and on the center axis.

Apparatus, Reagents and Calibration of the Instrument

1. Apparatus

Absorber, Fig. 1 is a line drawing of the absorber used for the test. A series of spirally arranged indentations are set into the 25 mm section of the absorber to prevent loss of the liquid reagent. These are not shown in the drawing. Smaller indentations of the same type are used to hold the bead column in place. A 10 ml. graduation mark is made to facilitate measurement of the reagent.

Meter, Laboratory wet test meter, 0.1 C.F. per revolution.

10 Ml. Pipettes.

Colorimeter, Model 400A Lumetron photoelectric colorimeter.

Colorimeter Comparison Tubes, Matched Pyrex test tubes, 18 mm. in diameter.

Uutra-Violet Lamp, Hanovia Inspectolite.

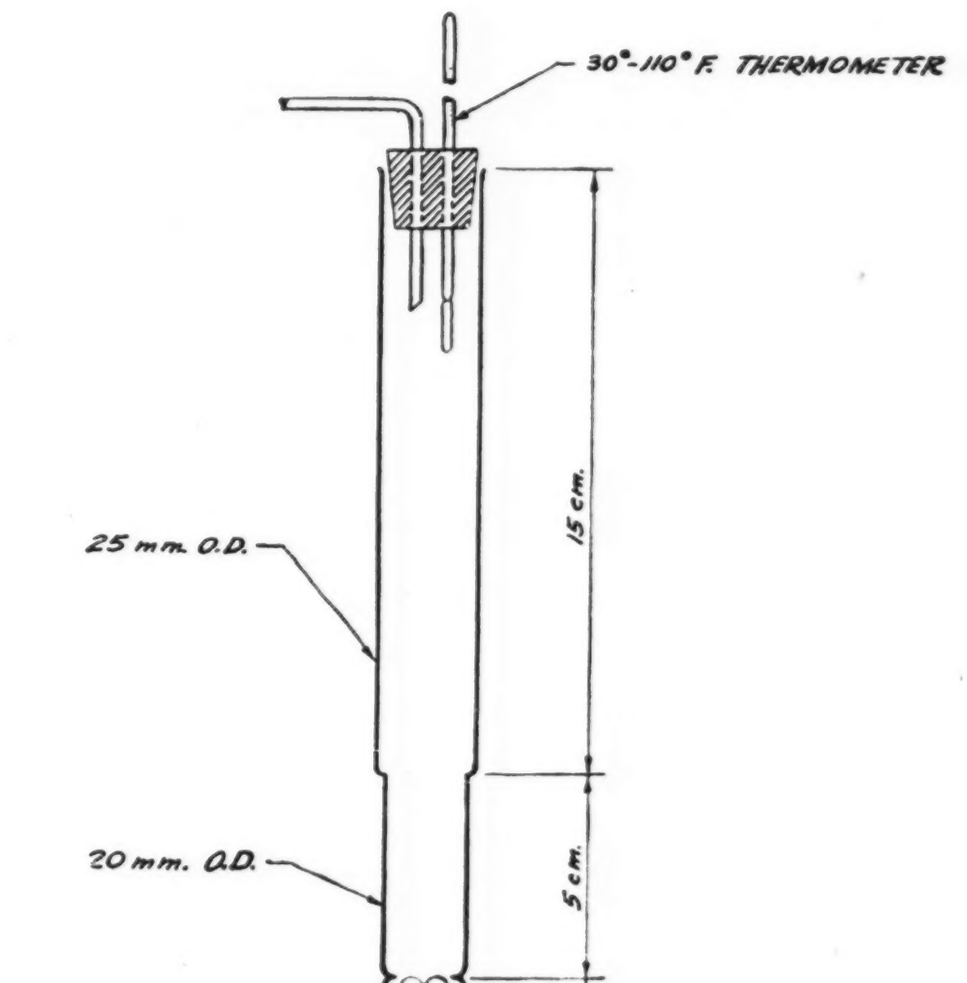


Fig. 1 (above) and Fig. 2 (below)

2. Reagents

Copper Butyl Phthalate, approximately 0.05 N. in butanol.

A mixture of 74 grams of finely ground phthalic anhydride and 50 ml. of n-butanol is heated in a 500 ml. flask over a free flame with shaking until the temperature is approximately 105° C. The agitation is continued as the flask is removed from the flame. The temperature continues to rise to about 120° C, at which point the mixture becomes clear. The product is allowed to cool and is then poured into a solution of 20 grams of sodium hydroxide in 1500 ml. of water. If the resulting solution is not acid to litmus, it is made so with glacial acetic acid. The acid solution is filtered through paper into a 4-liter beaker. and a clear solution of 65 grams of copper sulfate (pentahydrate) in 500 ml. of water is added slowly with vigorous stirring. The precipitated copper butyl phthalate is collected on a Buchner funnel, washed with water, and air-dried. It is then pulverized and dried in a vacuum desiccator.

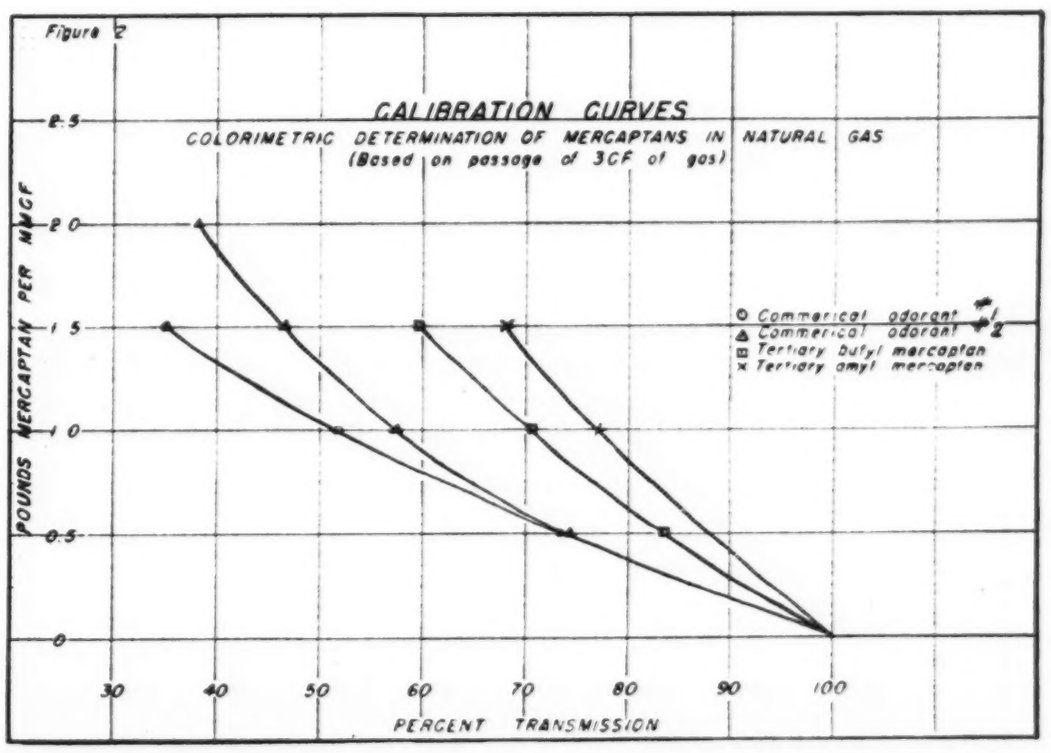
For an approximately 0.05 N solution of copper butyl phthalate, 12.7 grams of the salt are required. This amount is weighed into a 1000 ml. volumetric flask, dissolved in 50 ml of glacial acetic acid, and diluted to 1 liter with n-butanol.

This method of preparation is described by Turk and Reid.[2]

N-Butanol.

3. Calibration

The procedure for calibrating the colorimeter consists of weighing out approximately 50 mg. of the odorant in a small glass bulb and then sealing the bulb. The bulb is broken beneath the surface of n-butanol in a weighing bottle and enough additional butanol is added to adjust the concentration to about 0.4% by weight. Measured amounts of this solution, corresponding to 0.5, 1.0, 1.5, etc.. pounds of odorant per Mcf of gas, based on absorption of the odorant from 3 cu ft at standard conditions, are then added to 10 mls. of copper butyl phthalate solution in a matched colorimeter test tube. The solutions are exposed to ultra-violet light for 20 min, and the per cent transmission determined by comparison with a copper butyl phthalate blank. Separate calibration curves must be determined for different odorants and for different colorimeters. *Fig. 2* illustrates typical calibration curves for several commercial odorants and for several pure mercaptan compounds.



Leakage Barring Speeded With New Type Equipment

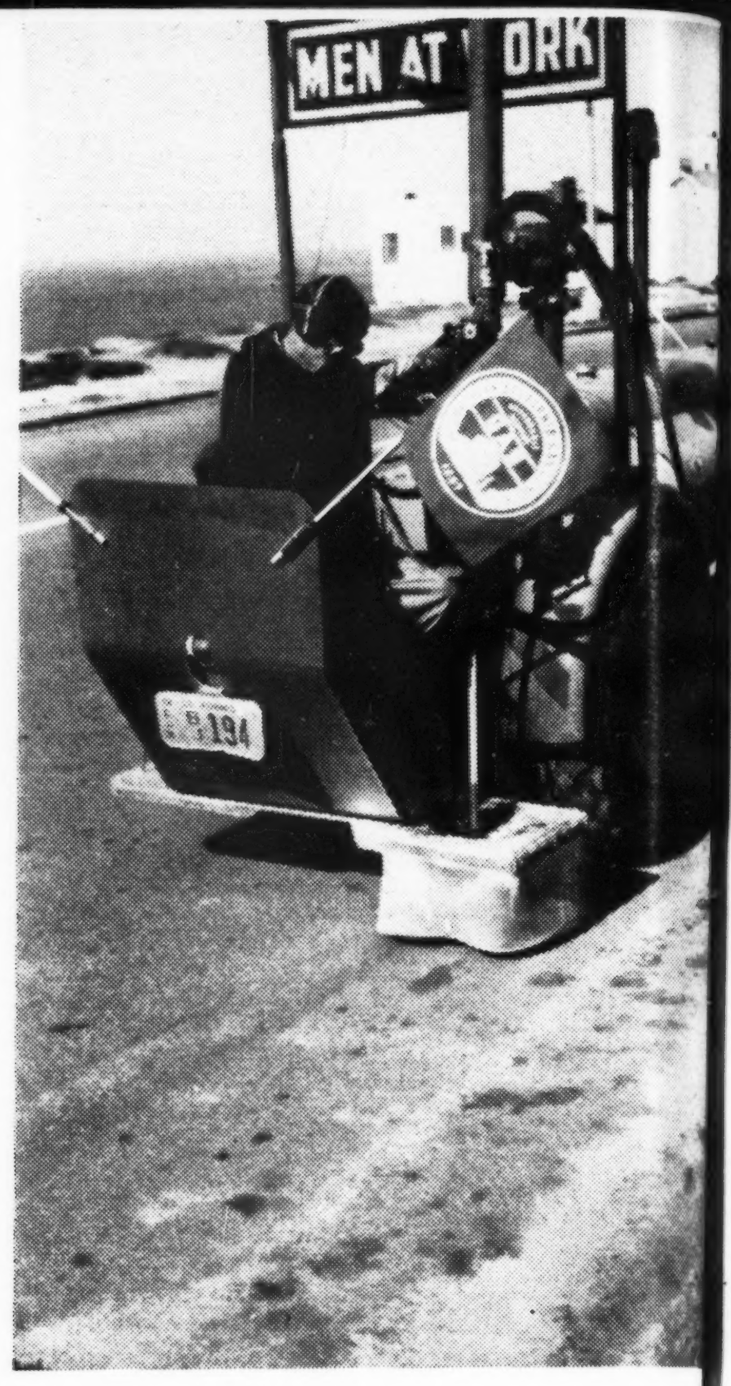
By R. E. HAUN

R. E. Haun

AMONG equipment recently developed for gas distribution work is the new Tractair unit consisting of a pneumatic-tired self-propelled in-line compressor and engine tractor for use in operating a pneumatic star drill which is also used as a skip loader and backfiller in some instances. The compressor has a capacity of 105 cu ft per minute. The air drill is mounted at the rear of the tractor unit and is raised and lowered with an air-actuated hydraulic hoist, the controls of which are placed within reach of the operator so that only one man is required. The Tractair pneumatic tires and transmission with several speeds permit road travel up to 15 miles per hour. The purchase price of the Tractair unit is approximately $4000 and an additional $1500 has been spent in developing simpler controls and safety devices, including a tilt trailer for transportation.

In use for street leakage barring work, the Tractair unit replaces the previous truck-mounted compressor. Considerable saving in man power has been accomplished with this unit as a crew of five men replaces the former 11-man crew. This saving in man power is principally accomplished by elimination of the following:

1. Two manually operated star drills.
2. One air motor, two man-operated, used for boring through the earth following the pavement bore with the star drill.
3. Truck driver used to move the compressor unit.



Closeup of the unit. Note "Men at Work" sign, steel guard, and red flags afford extra protection to operator.

4. Two crew men who assisted the foreman in locating the main and reading leak indicator.

The reduction in total man power of the crew permits the foreman to assist directly with the work rather than spending a greater part of his time in supervising the work of others.

The pictures show the Tractair unit in use and the crew at work. Following is a typical crew composition for leakage survey work:

1. Crew leader
2. Tractair operator
3. Crew man reading leak indicator
4. Crew man assisting foreman locating main and backfilling bar holes
5. Crew man used to take Shepard rod readings when required.

For pavement drilling a 1½-in. star drill with ⅞-in. hollow shank 40 in. long is used, while for earth boring only a ⅞-in. solid shank drill with built-up and hardened point is preferred because it permits leak indication readings immediately following the drilling of the bar holes.

Crew Production

For leakage survey information the bar crew drills holes over the main trough pavement and earth at 25-ft intervals approximately 3 ft deep. Where Shepard rod readings are required an

TABLE 1. PRODUCTION COMPARISON

Production	Compressor Truck	Tractair Unit
Total Footage Barred	108,651	90,058
Average Footage Per Day	10,865.1	9,005.8
Average Footage Per Man-Day	905	2,226.4

TABLE 2. COMPARATIVE COST OF THE TRUCK MOUNTED COMPRESSOR VS. TRACTAIR UNIT

Cost of truck mounted compressor		$7,000
Cost of Tractair	$4,000	
Cost of alterations and additions	1,000	
Tilt Trailer	550	5,550
Difference		$1,450

Mr. Haun, who is division superintendent of Southern California Gas Co. at Compton, presented this paper before the Pacific Coast Gas Assn. distribution conference, April 7-8.

additional hole is bored 2 ft laterally at every other interval. Production, of course, varies with type and thickness of pavement, kind of soil, and continuity of pipelines being surveyed. In some areas where the work is scattered, the average Tractair crew production varies from 1600 ft to 2300 ft of main surveyed per man-day. Record production by a four-man crew was 16,824 ft in one day barring through macadam. *Table 1* gives a comparison of 10-days production with the compressor truck crew and the Tractair crew, which clearly shows the footage-per-man gained in using the Tractair unit.

The production of the Tractair crew may be summarized by saying that its four or five-man crew is now barring as much main as was formerly done by an 11- or 12-man crew using a truck-mounted compressor.

Physical setup used when gas indicator readings are taken immediately behind the unit, as a protection to men taking the readings.

Crew Protection

Leakage crews working in congested areas are exposed to the hazards of traffic, more particularly so with the use of a Tractair unit than with the truck-mounted compressor, because of its low visibility. To minimize the hazard to the workmen the Tractair unit itself was provided with the following:

1. A special sign at the rear of the unit and above the operator reading "MEN AT WORK." This sign is set off by red flags and a red blinker light. Finally a steel guard has been placed across the rear of the Tractair to protect the operator should a motorist fail to see the other warning signs.
2. New rubber traffic cones outlining safety zones when Shepard rod readings are taken. These cones are placed in addition to the regular excavation signs normally used at street intersections to protect the workmen. They are placed by the crew ahead of the men marking the main location and are picked up after the man filling the bar holes has completed his work.
3. A special sheet rubber shield, placed around a corner of the floor plate adjacent to the drill. to prevent dust from the star drill blowing up in the face of the operator or annoying the public.
4. For use in transporting the Tractair to and from the job a special tilt trailer, necessary because the Tractair has such a low road speed and poor visibility from the operator's seat (which was lowered for greater convenience in operating the star drill). It was not found practical to tow the Tractair unit because of the type of steering mechanism, the lack of springs on the unit, and because bearings and gears in the differential were not designed for speeds in excess of 15 miles per hour.

In light pavement and earth where the solid shank drill is used, gas indicator readings may be taken immediately in the wake of the Tractair unit. In these cases the pickup truck follows directly behind the unit to provide protection from traffic for the crew men taking readings and filling bar holes. This arrangement is shown in the picture of the unit and pickup truck in working position; note also the safety signs, flags, red lights, etc., in use.

Alterations to Tractair Unit

It was found desirable to make alterations in some of the control devices to provide for greater convenience to the operator, and consist of the following:

1. Altered clutch throw-out pedal arm to reduce pressure required to disengage clutch.
2. Extension arm added to the by-pass valve to permit the operation of this valve from the driver's seat.
3. Lowering and relocation of the operator's seat to make it more accessible to the air drill controls.
4. Extension of the floor plating to protect the feet of the operator from the air drill when in vertical motion.
5. Installation of a dust shield around the base of the floor plate to reduce dust annoyance.
6. Extension of the valve handles on the air drill controls to make them more readily accessible to the operator.
7. The installation of a clamp and arm around the body of the air drill so that it could be maneuvered into position by the operator.
8. Installation of a special odometer graduated for measuring twenty-five foot bar hole intervals.
9. The installation of a traffic cone rack for convenience when placing and picking up these cones.
10. Installation of bucket seat with back rest and swivel for comfort and convenience of operator.

TABLE 3. ADVANTAGES AND DISADVANTAGES

Following is a summarization of the advantages and disadvantages of the Tractair unit compared with the truck mounted compressor for leakage survey work:

Advantages

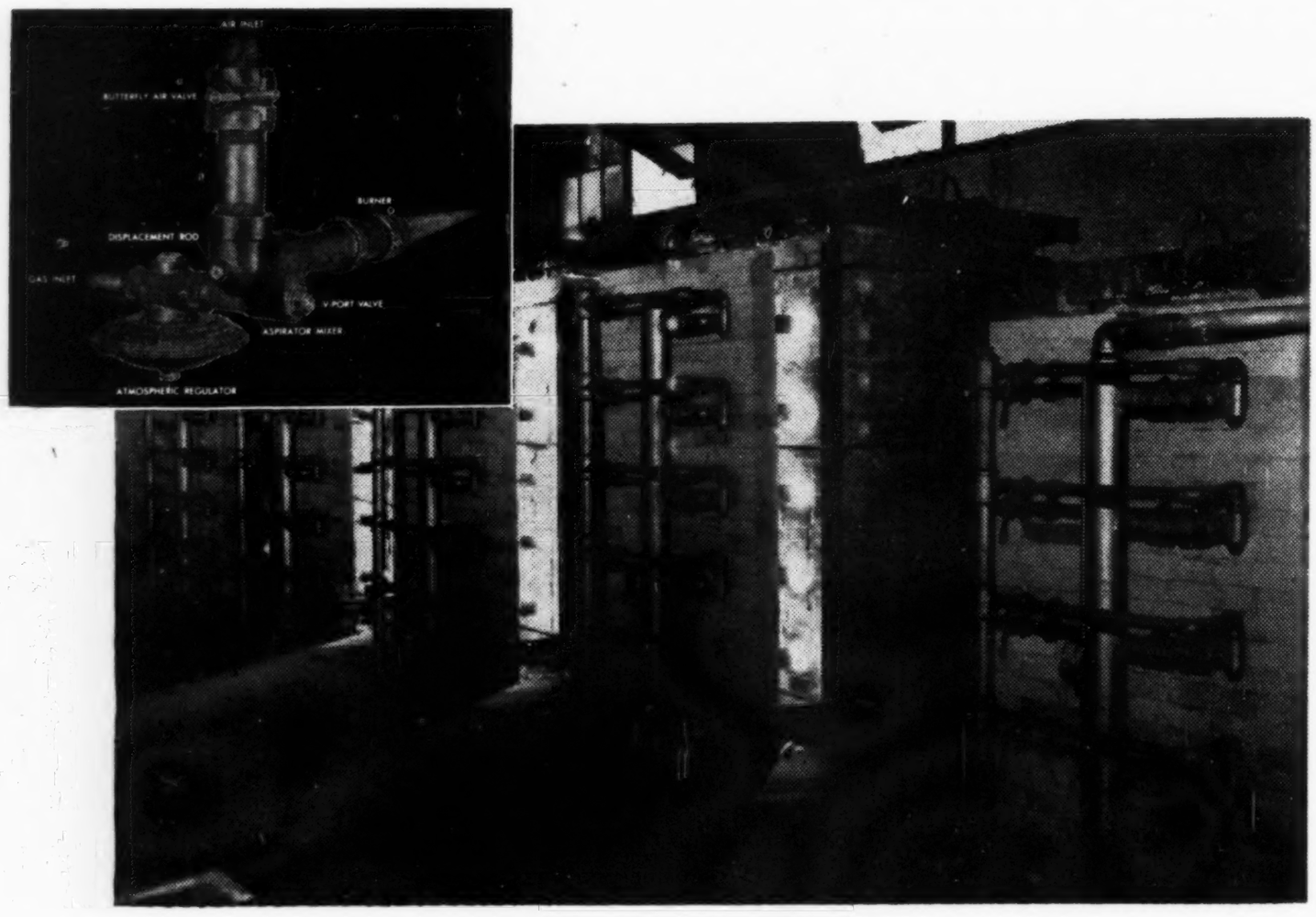
1. Lower cost of barring equipment.
2. Lower cost per foot of main barred.
3. Increased barring footage per crew man.
4. Easier operation requiring less physical exertion by crew men.
5. Better acceptance by crew men.

Disadvantages

1. Tractair unit requires more field maintenance than regular truck-mounted compressor and repair parts are more inaccessible.
2. Tractair unit as purchased requires alterations and modifications for usage for safety in traffic and for convenience of operation.
3. For Shepard rod work second bar hole is more difficult to make.

In reviewing the advantages and disadvantages it is evident that the Tractair is more economical than the truck mounted units previously used and has good acceptance by the field crews because of the minimum effort required by them. However, improvements can still be made in the location and operation of the controls on the Tractair unit and the use of a fluid clutch would eliminate shifting gears every 25 ft.

The Tractair unit with modifications made for convenience and safety provides a very satisfactory piece of equipment for economical leakage survey work.



AT LEFT, view of five of the ten 3000° kilns at McDanel Co. Special insulating brick walls protect gas burner equipment from intense heat. Inset is photo of equipment.

AT RIGHT, a loaded car is being pushed into a luminous-flame-fired, car-type kiln. The No. 8 kiln is in the process of being fired, with the loaded car in place.

Gas Flexibility Pays Off in Industrial Porcelain Firing

By J. N. KENNEDY

INDUSTRIAL porcelains take a lot of rough treatment when used in the manufacturing of iron, steel, chemicals, drugs and paint.

Exclusive

To withstand many critical operating conditions, refractories must be fired at high temperatures and under precise control.

At the McDanel Refractory Porcelain Co., Beaver Falls, Pa., industrial porcelains have been fired in special gas-fired kilns since the company was founded in 1919.

The McDanel plant utilizes modern manufacturing processes. A steadily increasing demand for industrial porcelains forced the company to expand and increase its production facilities. An expansion program has just been completed in order to meet an unprecedented demand for porcelain balls and brick, and to expedite deliveries. Press facilities for brick production have been increased by 50%. Kiln capacity has also been increased to take care of this increased production. Gas-fired bottle type periodic kilns and car type periodic kilns are both used at McDanel.

High temperature porcelain parts such as pyrometer tubes, combustion tubes and special research refractories are produced at the McDanel plant in addition to grinding balls and mill lining bricks.

Feldspar, ball clay, kaolins and flint are the basic raw materials used in the manufacture of balls and bricks. Each of these raw materials is stored separately before being weighed, according to a predetermined formula, and thoroughly mixed in batches. The batch is then placed in a ball mill with water. It is ground for about three hours.

The resulting slip is carried to a large storage container called the "rough tank," where it is kept until needed for the manufacturing process. To eliminate any contamination or foreign matter, the slip is passed over a fine mesh wire. Then it passes over a magnetic separator. During this purifying, undesirable materials such as iron, lignite and peat are removed.

"Leaves" Formed

The slip is then delivered to the filter press under a pressure of 90 psi. This high pressure removes all but 30% of the water. When removed from the filter press, the material is in the form of thin. pliable sheets or "leaves." Following removal from the press, the leaves are carefully stacked. They are cut into smaller pieces when needed and placed on a conveyor which delivers them to the pug mill area.

These pieces of prepared body are loaded into the pug mill. When extruded through a die the material is in the form of a long roll. Various sized dies are used, depending on the size of the required ball. The roll is cut from the pug mill at a predetermined length and is then placed on another cutter which cuts it into smaller sizes. This assures the formation of a specified size porcelain ball.

The next step is to shape the cut sections into balls. This is done by carefully hand-rolling the sections into a spherical shape. The resulting balls are placed in drying trays which remain for a controlled period in a gas-fired drying room where two unit heaters maintain a temperature of 140° F. This drying operation completely dissipates any moisture not removed during earlier processing. When thoroughly dried, the balls are loaded into saggers capable of holding about 20 3-in. balls. The balls are then loaded into a kiln to be fired.

The materials used in the manufacture of mill lining brick are basically the same as those required for the porcelain balls. However, the formula must be different in order to obtain a body specifically created to stand constant erosion. Porcelain balls are designed to have a rough texture with a minimum of glassy material. They are never smooth and must not be porous. Hardness and grinding properties are im-

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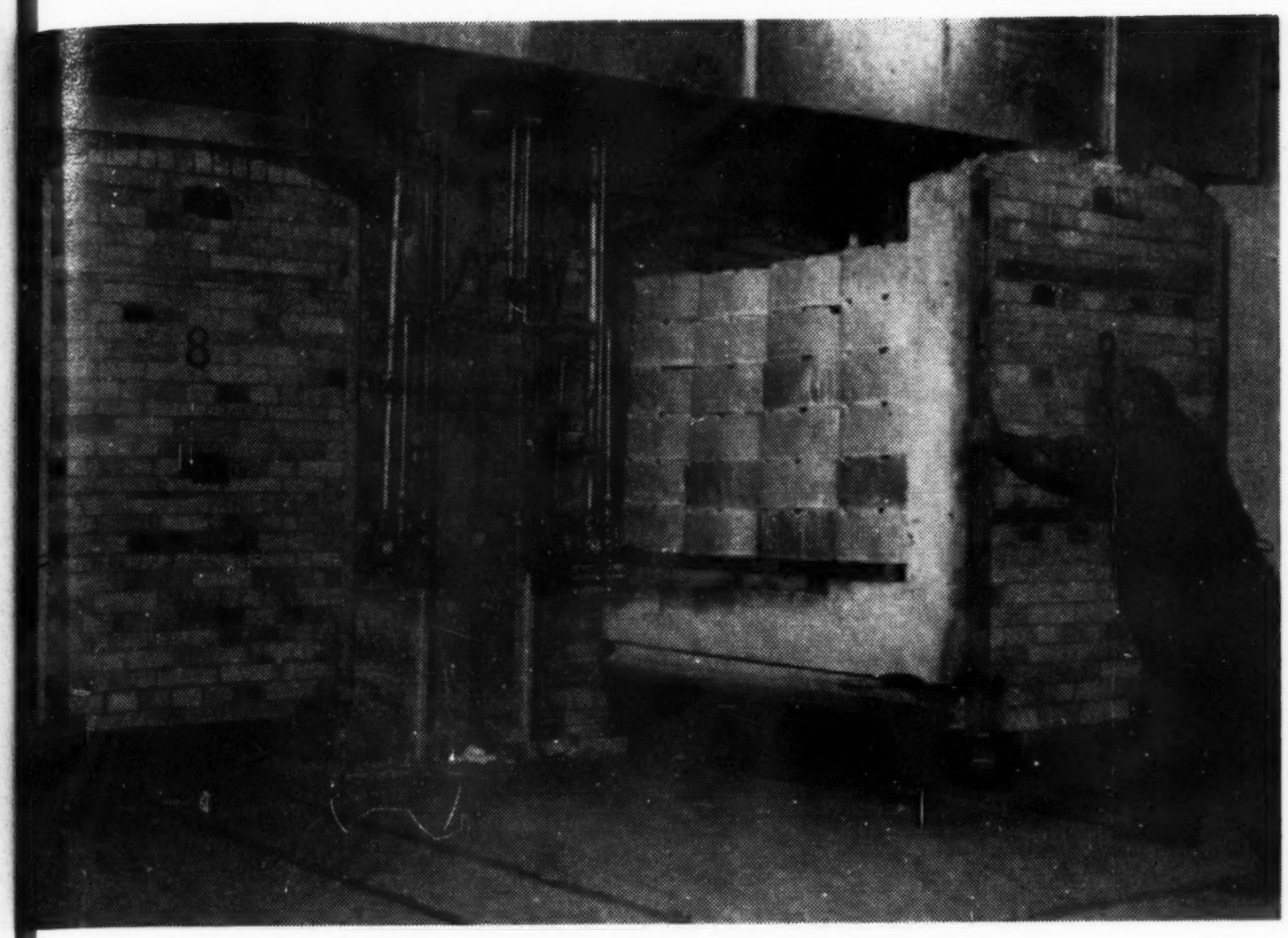


portant in porcelain balls.

The clay leaves coming from the filter press, which are to be used for porcelain bricks, are separated and placed on racks in the drying room. Here they remain until the leaves contain only 12% to 14% water. In contrast to the preparation of the balls which are "wet formed," the brick clay is "dry pressed." It has a water content of approximately one-half that of the ball clay material.

The dried clay is then placed in a crushing machine, which reduces it to small granules. At this point the moisture factor is taken. Only a small tolerance in the per cent of water content is permissible. If the moisture is too low, the material is spread out and more moisture is added. Should there be too much moisture, some dry clay is added. Due to the controlled drying period to which the leaves are subjected, this latter condition is seldom encountered.

Brick Forming

When the permissible water content is achieved, the material is run through a pulverizer. After passing through a coarse mesh screen, the material is ready for the forming of the brick.

The dies are filled with the dustlike material and accurately formed in the hydraulic "dry presses." The straight run-of-brick are formed on power presses. Unusual shapes and small sizes are formed on hand presses and other special equipment. Bricks are then placed on drying racks where they remain for a specified period of time at a controlled temperature. The edges of all bricks are smoothed off by hand. The bricks are then loaded into saggers for their trip to a kiln for firing.

The grinding balls and mill lining bricks, having about the same body, are fired in the same cycle and to the same temperature. Therefore, they can be placed together in one kiln. They are fired in either a bottle type periodic kiln or a car type periodic kiln. In either case the kilns are fired to a temperature of 2250° F, using North American luminous flame burners, Series III. Due to the bottle type kilns' much larger capacity, it requires a firing cycle of 84 to 96 hours, depending on the size of the balls and bricks. The car type kiln requires approximately 48 hours.

These kilns must have accurate time-temperature cycle control. By using natural gas McDanel is able to get the controllability required to bring the kilns up to temperature and to have a uniform heat maintained throughout the kiln. McDanel now has in operation two bottle type and nine car type kilns, all of which are fired by modern gas-burning equipment.

While the porcelain balls and bricks have a long firing period in large kilns, other porcelain products, such as pyrometer protection tubes are fired in high temperature kilns. There are 16 such kilns in use at the McDanel plant.

These tubes, made from a special prepared body, are formed by casting from a long circular mold. The slip is run into the mold and is allowed to stand for a certain length of time, depending on the thickness required for the wall of the tube. The mold absorbs water from the slip and when it is tipped up, the excess slip from the center runs out, leaving the tube in the mold. The mold is then set up for further drying out of the tube, during which the tube contracts in size, facilitating its extraction from the mold. When these tubes are thoroughly dried they are ready to be fired.

The high-temperature gas-fired ceramic kilns at the McDanel plant are also the periodic type. The top of the kiln is removed with a crane and set aside while the kiln is being loaded and unloaded. The tubes, when placed in the kiln, are suspended by means of a lip on the tube top. The kiln top is then positioned and sealed, and the kiln is ready to fire.

Kiln Selection

There are three different heights of kilns at McDanel to take care of the different lengths and sizes of tubes. These kilns are fired by means of aspirator mixers and North American open nozzle burners. Mounted on the front and back of the kiln, they fire from opposite corners.

The smaller kilns are equipped with six burners (three forward and three aft), while the larger kilns have 10 burners. During the firing cycle of 16 to 18 hours, the kilns are brought to temperature of 3000° F.

The porcelain balls and bricks come from the kiln in the form in which they are to be used—grinding media and mill linings. They are then tested and inspected. The balls are loaded into an uncushioned mill. It is charged about two-thirds full for a test run. When the run is completed, the balls are dumped and hand sorted. Any imperfect balls can easily be discovered and removed trom a "picking belt." The McDanel plant has employed this method of testing balls for more than 20 years. In addition to a final inspection, the brick must be gauged for size to assure uniformity.

The manufacture of porcelain grinding balls and mill lining bricks requires the utmost care, accuracy, and control in order to produce consistently uniformly high quality products.

The use of natural gas in the McDanel Refractory Porcelain Co. is indicative of the general trend of gas for industrial processes. The controllability of gas as to atmosphere and temperatures enables this manufacturer to predetermine the fire-off time. With other fuels, this is always an uncertain factor.

Over a period of years, with the use of different types of burners, McDanel has found that the use of luminous flame on the bottle type periodic kilns and the car type periodic kilns has aided in producing a tough, durable type of porcelain for ball mill use. The extremely high temperatures to which McDanel fires the combustion tubes and pyrometer tubes eliminate luminous flame.

A study of a vexing municipal problem and practical methods of minimizing it

Reducing Surface Traffic Interference

THE interference with moving street traffic by various substructure construction and maintenance operations is not a new problem. No city is free from such interference, and it may be more or less in other places than in Los Angeles. Although there will continue to be necessary traffic interruptions as extension and repair of utility service keep abreast of the growth in population, they can be reduced to a reasonable minimum. This minimum, it is believed, will be accepted by the public when, through publicity and other educational means, a better understanding exists as to the necessity for the interruptions. The problem offers a challenge to the ingenuity of those attempting to reach this "reasonable minimum"—well worth any time and effort devoted to accomplish it.

A very large proportion of the motor vehicles and the public transit vehicles in the Los Angeles area will have to continue to use the city's existing streets. Any interference with this traffic at the time of traffic peaks amounts to interference with workers going to or from their places of employment, and must be regarded as a serious matter.

The traffic movement finds itself caught in a cycle. Population growth and city progress require the expansion of all utility services. Frequent rearrangements and repairs must be made. Most of these services, of necessity, make use of the streets or are in substructures within the streets. Expansion and maintenance will require some traffic interference. The problem then becomes one of determining the principal causes of surface traffic interference and doing what can be done to reduce to a "reasonable minimum" the interference brought about by these activities.

Types of Interference

Traffic investigations have developed that a great many different types of operations interfere with traffic movement. However, the three principal causes of traffic interference are these:

(a) Excavations. Growth of a city makes necessary the extension of all utilities needed for the use of its inhabitants, but the public may justly expect a reasonable minimum of interference.

(b) Open Manholes. The need for opening manholes continues during their entire period of use, not just for the construction period as in excavations. Where they are located in the streets, some traffic interference will result. The public may justly expect a "reasonable minimum" of interference in these operations, also.

(c) Parking. Where parking is not ordinarily permitted, inconsiderate parking of work equipment or employee-owned vehicles has been found to offer decided and often unnecessary interference to traffic movement.

Each of the three foregoing causes of traffic interference will be covered more fully in this treatise in the light of the studies and investigations that have been made. It is of interest to note here that an important element entering all operations is "time"—time of day, day of week, season, etc. The time of day and the day of week when the work is done were found to have a material effect on the severity of the traffic interference. Too drastic a restriction of time for utility work operation will increase the cost of service to the public and, in turn, react unfavorably. Time is, therefore, an important part of each of the three major causes of interference with traffic and entered into the studies made.

Throughout the study and interference investigations that were made, it was obvious that much can be accomplished in reducing traffic interference by thoughtful consideration in placing barricades and work equipment, handling the spoil bank, etc. The consideration on the part of the foreman of his responsibility with respect to minimum traffic interference is just as much a part of his supervisory duties as are other job operations for which he is responsible.

Excavations are troublesome from a traffic standpoint for various reasons. The job may extend a considerable distance in one street, with laterals being placed as required; the street may normally be carrying a sizable traffic load in which case even short excavations may provoke motorists; the placing of barricades or work equipment in positions that create unnecessary interference is disturbing to most drivers; the failure promptly to remove or rearrange barricades and work equipment as the job permits results in unnecessary traffic interference; excavations made and not followed promptly by facility placement unnecessarily interfere with traffic.

To any thoughtful person these contributing elements to traffic interference, while only a few of many, serve to stress the need for cooperation on the part of the traveling public and those doing the work. The effort to keep interference with the flow of traffic at a "reasonable minimum" by consideration of the public's needs will be helpful in obtaining the public's cooperation and tolerance for the work that must be done to insure progress. Experience indicates that providing the public with information pertaining to a project is good only if it is apparent that reasonable effort has been and is being made to cause as little inconvenience to the motorist as possible. Where this interference is reasonable with respect to the work necessary to be done, the public, in general, appreciates brief information concerning the need for and what the project will accomplish. This may take the form of a public announcement from time to time for large projects—a sign, or other convenient means, such as news items in neighborhood papers.

The study indicates that the more important elements to be considered in connection with excavation work in the reduction of traffic interference are these:

(a) Barricades. They are important from a protection standpoint, and should be placed to provide safety of operation, but also with the least inconvenience to the public. They should be rearranged, as conditions permit, to provide less interference with traffic flow.

(b) Time Work Performed. The heaviest movement of surface traffic is between 7 a.m. and 9:30 a.m. and again between 4 p.m. and 6 p.m. Any interference with the flow of traffic on major streets during these hours hinders the greatest number of motorists. Monday through Friday are the heaviest traffic flow days . . . the same days most workers are on the job. The traffic flow becomes exceedingly heavy, of course, during December. These factors should be given consideration and every reasonable effort made to so program the work to be done that interference with traffic flow is at a minimum consistent with the nature of the required work and cost of the utility service to the public.

(c) Work Equipment. The failure to consider where it can be placed to meet the requirements of the job and, at the same time, keep the interference to the public at a reasonable level, is a frequent occurrence.

(d) Motor Vehicles. There are two parts

to this problem—company work vehicles and employee-owned vehicles. Consideration should be given to the need of work vehicles at the excavation and if not required for work operations they should be placed on side streets or where they will interfere with the traffic flow the least. Employee-owned vehicles are often found to be placed near the point of work merely as a convenience for easy access. In cases where such parking results in added interference to traffic, some other parking location should be found.

(e) "Toe" Boards. Where traffic flow is heavy the use of "toe" boards, or other devices, such as "bins," will prevent the spoil bank from occupying too great a space at its base. Their use frequently will result in an added traffic lane.

(f) Use of Steel Plates. The proper use of steel plates held firmly in place is an important aid in holding traffic interference at a reasonable level. They are of value at street intersections, driveways, some portions of streets, on walks, and wherever required to permit necessary passage of vehicles or pedestrians, particularly when work is stopped.

(g) Premix Surfacing. Experience has developed the need and use of premix—"black top"—in the temporary repair of paving where excavations have been made (in some cities its use is required by ordinance). It should not be used for permanent repairs.

In the case of excavation work the completed job is, in general, the first and last time this kind of interference with traffic will occur at the specific location. This is usually the case, except where some excavation work may be necessary because of repairs. The necessity of opening manholes from time to time for a particular purpose continues during the entire period of the structure's use. Some utilities, such as the power companies and the telephone companies, obviously have a greater need to perform work in their manholes than do others. Where these manholes are in the streets—and, of necessity, many must be located there—they tend to become a "recurring incident" insofar as interference to traffic flow on busy streets is concerned.

The Result

This type of interference will, of course, affect more motorists as time goes on inasmuch as motor vehicles in Los Angeles are increasing in number and this increase will no doubt continue. The trend will then be toward slower movement of motor vehicles unless every effort is made to reduce the interference caused by opening manholes to a reasonable minimum.

Investigations of surface traffic movement around open manholes disclosed many unnecessary interferences, such as improper placing of barricades, motor vehicles parked too close to the open manholes, splicing carts, or other work equipment poorly "spotted." Generally, the opening of a manhole immediately blocks one lane of traffic.

Usually, if consideration is given by the worker to "how" and "where" the warning signs and barricades are placed, consistent with performing his own work safely, traffic will move with reasonable speed past the obstruction. The problem then is to obtain a better balance between the maintenance and repair needs of the utilities to open and work in manholes, and surface traffic movements.

It has been determined that the more important items for consideration in connection with open manholes include some of those listed under excavations. The comments on barricades, time work performed, and motor vehicles, apply to the same extent to operations carried on in open manholes. Some additional consideration may be given to two of these items when work is being done in manholes, namely:

(a) Barricades. They should be kept, insofar as possible, in the lane of traffic obstructed by the open manhole. In many cases, they may be so set as to direct traffic on both sides of the manhole. A barricade is frequently placed between an open manhole and the curb, although often this is not necessary. It hinders traffic and offers no protection to the worker except in his travel to and from the curb. This travel can be materially reduced with a little planning.

(b) Time Work Performed. Emergency repair work in open manholes may be necessary at any time, even in rush periods of traffic flow. It should be possible, however, to program routine testing or certain construction work in manholes so as to keep them closed during heavy traffic flow in morning and evening periods. When emergency repair necessitates interference with traffic during a busy period, every effort should be made to keep such interference at a minimum.

When excavation work is being performed or when manholes have been opened and the barricades placed for either operation, and these barricades force motor vehicle traffic across the center line of the street, a very dangerous traffic accident hazard is created. Every consideration should be given to avoiding such a condition, if possible, as serious injuries have been the result in many cases. Cooperation of the police must be obtained if it is impossible to avoid such condition.

Under the provisions of the state law no right is given, except under certain emergency conditions, to park any vehicle in restricted zones. The intent of "No Parking" is to provide the full width of the street for vehicle travel. A vehicle parked along the curb immediately blocks one lane for travel.

The study disclosed that on numerous occasions, parking restrictions were being violated unnecessarily by persons using city, utility, or other such vehicles. The use of such vehicles does not carry with it the right to park them with no regard for restrictions.

The proper observance of traffic regulations by all drivers of motor vehicles is a powerful aid in the movement of surface traffic. Proper driving, standing, and parking are important from a public relations standpoint, and especially so for those in public service.

Motor vehicle traffic is increasing and it must use the highways. The highways are intended for moving traffic and not for the purpose of providing storage space for standing vehicles. This problem of traffic interference is then important and worthy of thoughtful consideration on the part of the vehicle owner, the driver, and those doing work in the streets.

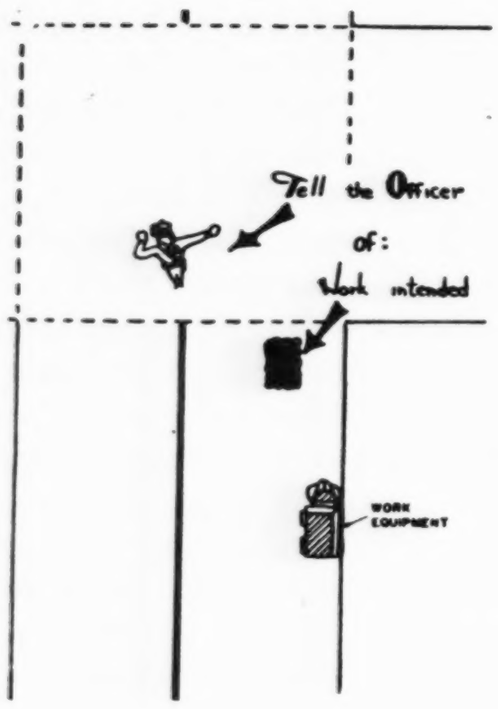
Good public relations are generally the result of public opinion and all companies, small or large, desire that these relations be maintained at a high level. The various utility companies' public relations are with people—they are the public. These people develop their opinions of a utility by what they see the crews doing—the repair work, street excavations, working in open manholes, handling and parking trucks, etc. There are a multitude of operations, such as these, which are a necessary day-to-day job. But many of these may offend when done carelessly or thoughtlessly. The company is likely to be judged efficient or not efficient by what the people see, as well as the service they receive. It will be the *little* things that are done or are not done that will really count.

(Methods of reducing interference are described on the next pages.)

TO THE END that public utilities and other agencies using underground facilities might gain and hold public goodwill, the Substructure committee of Los Angeles (of which William Henderson, Southern California Gas Co. distribution engineer, is a member) appointed a special subcommittee to study the problem of surface traffic interference and recommended corrective methods.

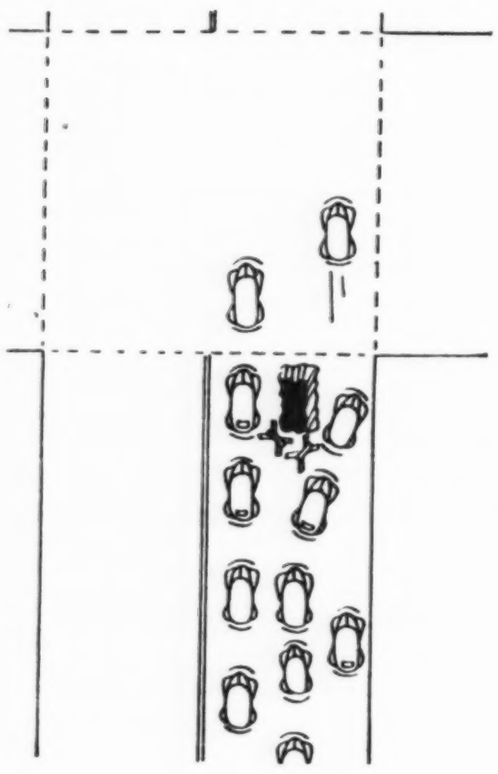
This presentation is a condensation of the subcommittee's report, which it is felt will be of value to all cities in this period of rapid population growth. The dual problems this growth has brought—crowding of streets and expansion of underground facilities—can ultimately be solved best by long-range planning; but the immediate problem is to secure more effective use of what we already have.

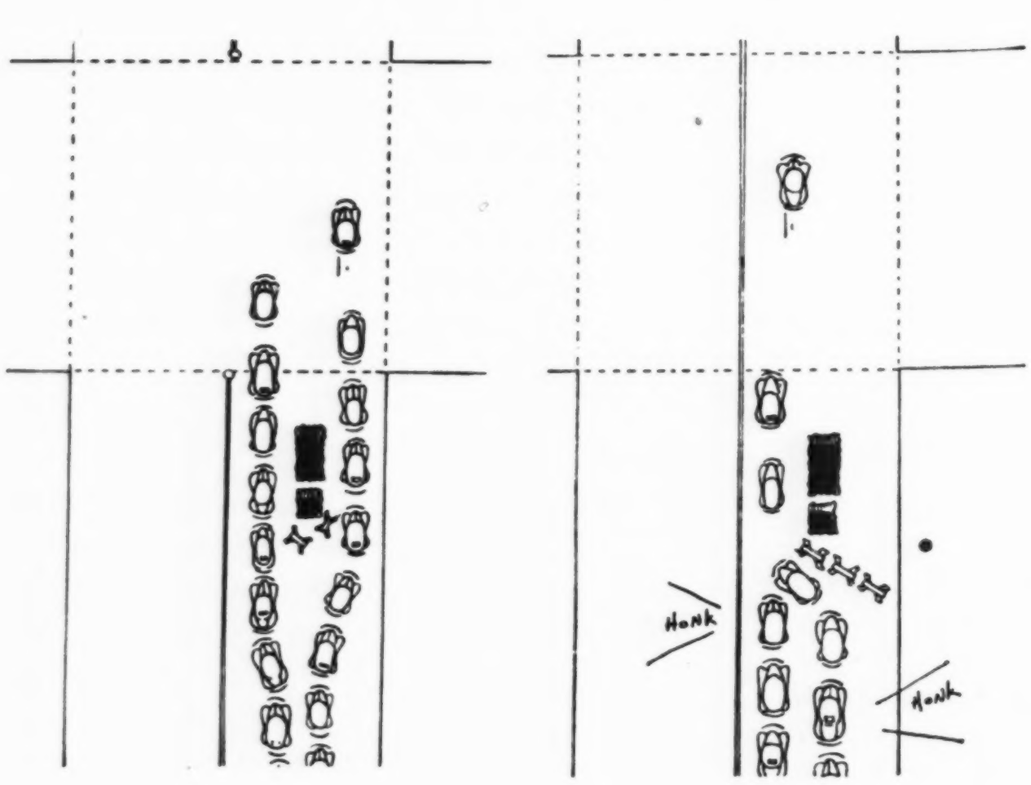
Methods of Reducing Surface Traffic Interference



Contact with Police Officer. Where police intersection traffic control is in operation, the officer on duty should be contacted and given a brief explanation of the work to be done and estimated time period involved. Any suggestions he may have regarding the traffic flow should be solicited and adhered to. The required notification to the authorized agency of the city should also be made.

Open Excavations: (a.) They are a hazard; protect motorists, pedestrians (children especially) against injury at all times. (b.) They should not be kept open longer than necessary, consistent with work being done and traffic flow. (c.) At intersections, job should be planned so that only a portion of crossing is closed at any time—the portion open depending on traffic flow. (d.) If part of street is completely blocked by excavation work for a time, arrange to guide traffic around obstruction safely.



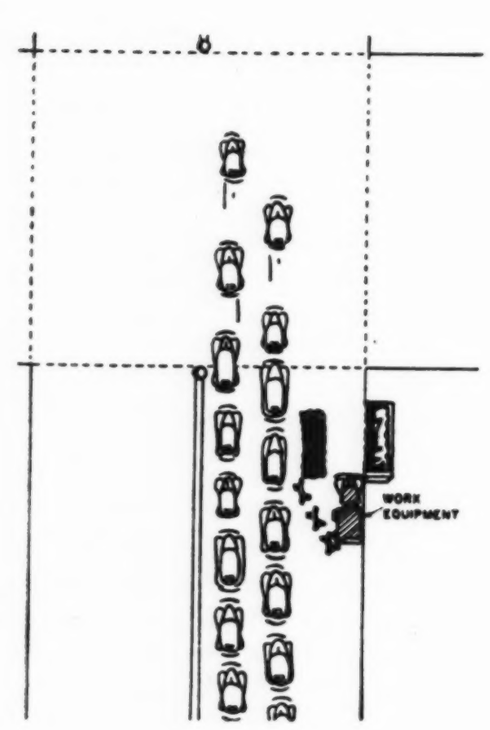


Barricades: Consideration should be given to: (a.) Providing protection to both worker and public with minimum interference to the public. (b.) Rearranging as conditions permit to provide less traffic interference. (c.) Providing sufficient barriers to protect both motorist and pedestrians—rope, fence, wooden horse, rubber cones, etc.

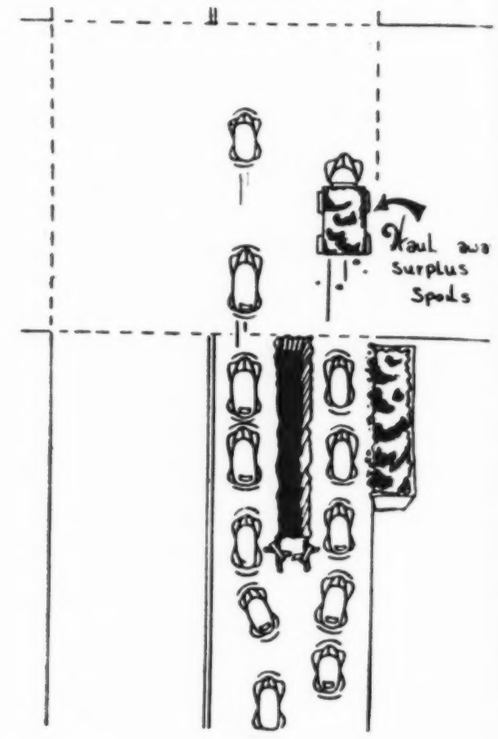
The investigation disclosed many cases where barricades placed a few feet from where they were placed, would have permitted another lane of traffic to flow.

Traffic Lanes: Never force traffic to the left of center line of the street except when no other means of movement is reasonably available. Police permission must be obtained to force traffic over center line. Guide traffic around obstruction by means of rubber cones, directional barriers, etc. Keep adjacent lanes open when one is blocked by excavation or manhole. Notify other public utilities, such as streetcars, which might be interfered with.

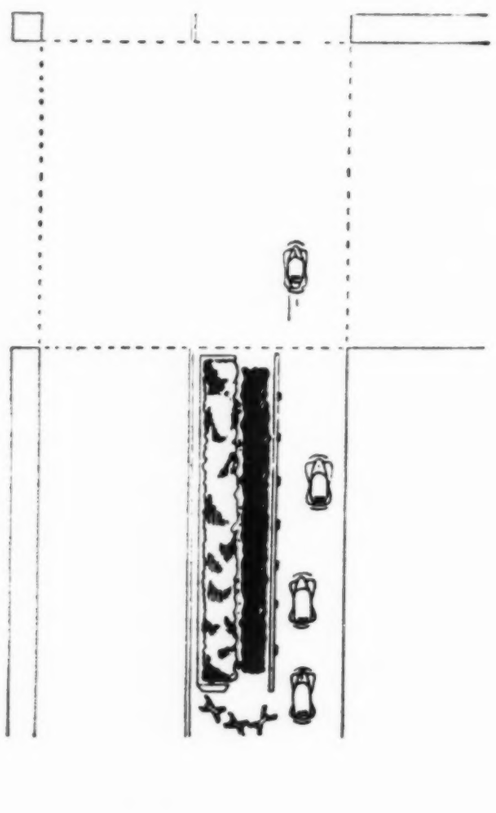
Spoil Bank: This may offer more traffic interference than necessary by spreading over too large a portion of the street, or the dirt may become a hazard in wet weather.



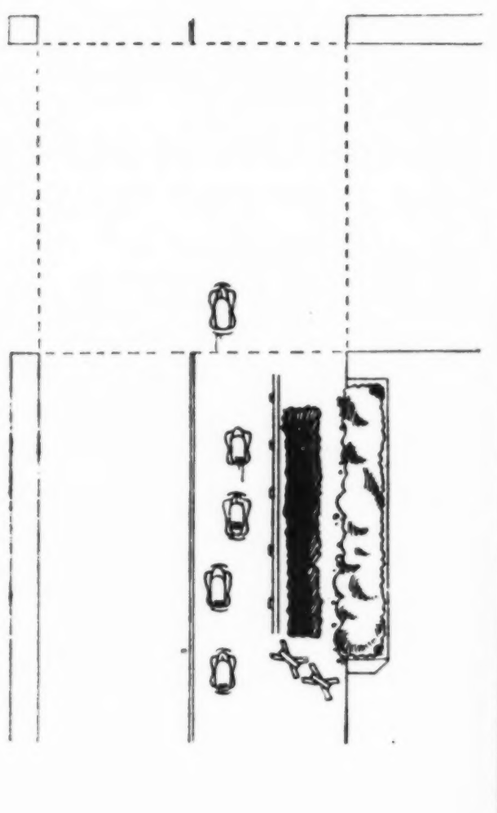
It should be contained by the use of toe board or bins on those streets where spreading would unduly interfere with traffic movement.



At street intersections it should be hauled away when it will not be used. This will provide the least interference with intersection traffic.



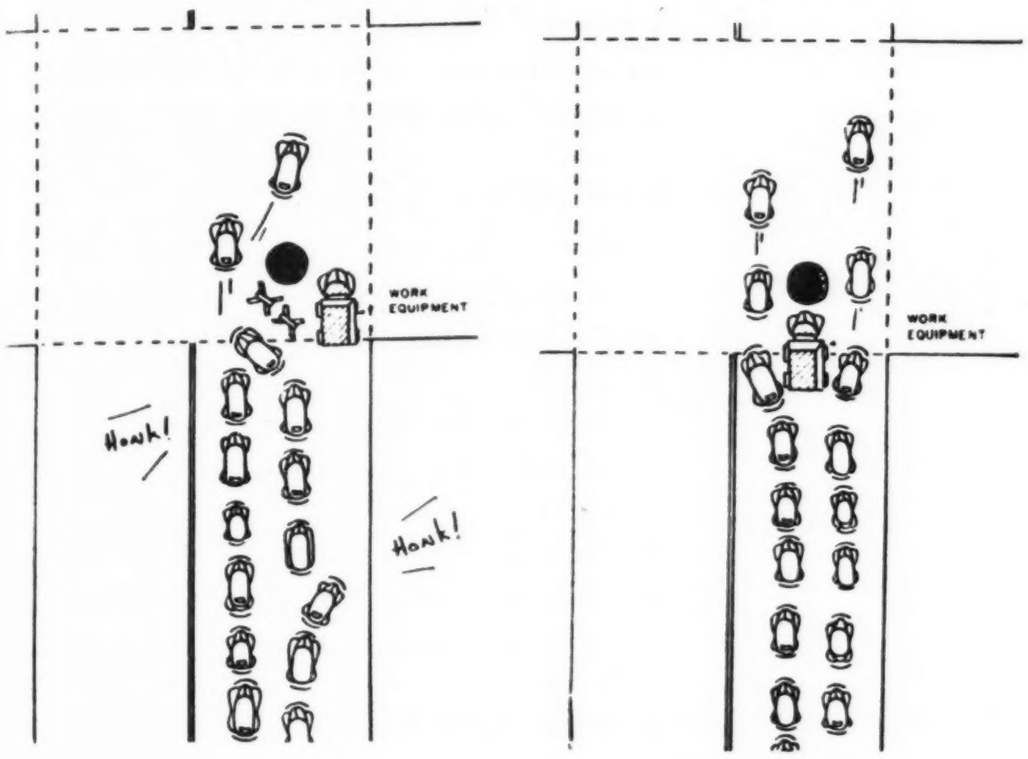
When excavation is in outer lane, confine excavation and spoil within outer lane by use of bin construction or toe boards to prevent spoil from spreading into and blocking another traffic lane. A rail guard on traffic side of trench.



When excavation is in curb lane, place the spoil on the curb side, after first covering the gutter for a free flow of drainage. Boxing of the spoil on the sidewalk is essential. . . Rail guard on traffic side of trench.

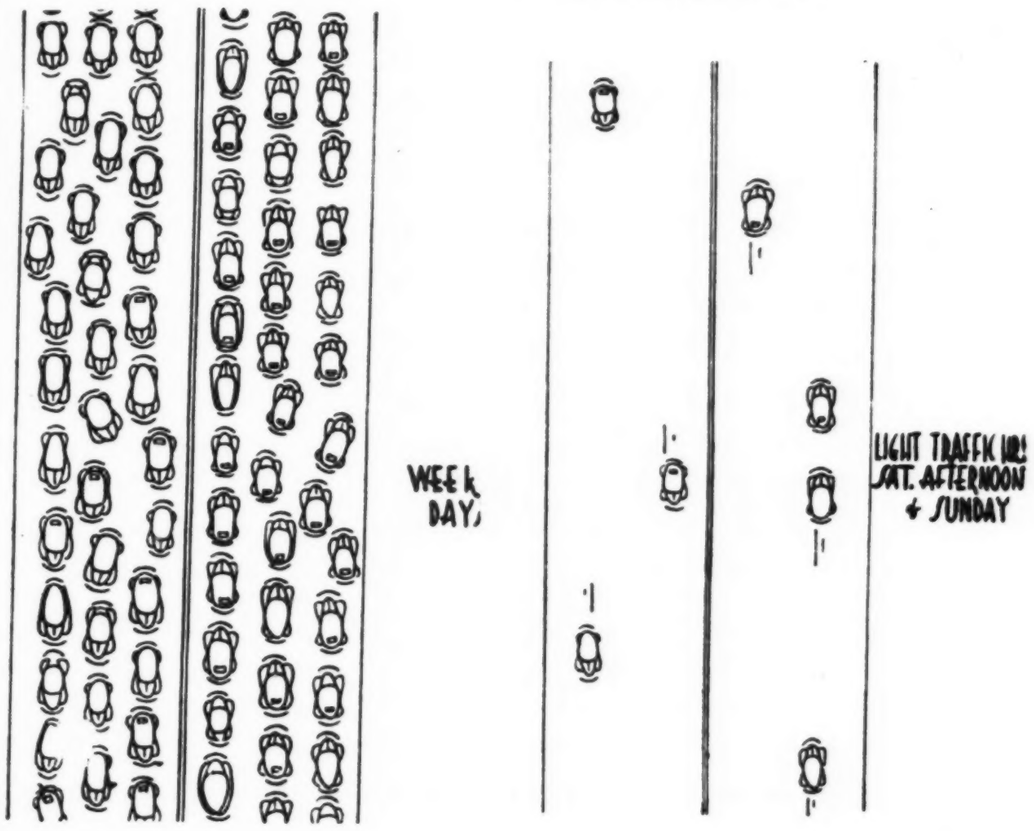
Temporary and Permanent Resurfacing: Trenches left with tamped dirt as a surfacing material are not satisfactory for motor vehicle travel. The use of premix or "black top" is of considerable value as a temporary resurfacing material. The surface remains relatively firm and when replaced in a reasonable period with permanent paving offers a satisfactory temporary excavation repair. Its use is increasing and is required by ordinance in many cities. Proper follow-up to see that the temporary surfacing is replaced with permanent paving is very important.

Work Equipment: Inconsiderate placing of pumps, mixers, digging machines, tool boxes, necessary trucks, etc. frequently blocks, unnecessarily, a traffic lane. Care should be exercised as to:

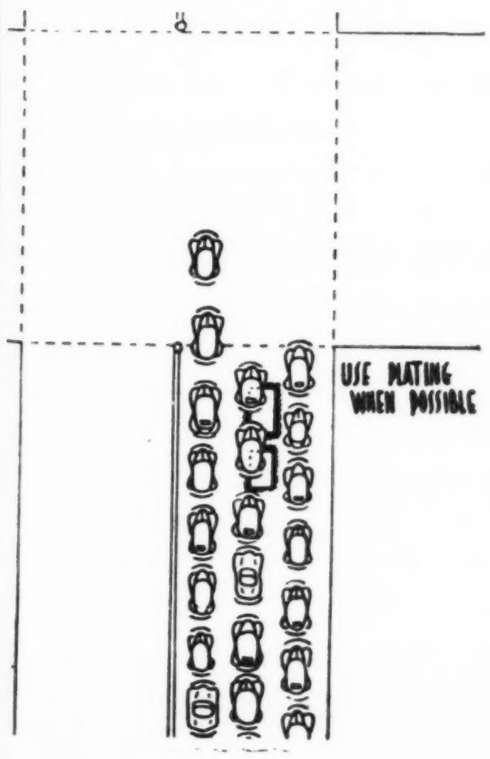


Its use at street intersections: Thoughtful consideration is necessary if traffic interference is to be at a minimum.

Need for equipment: Frequently it may be placed in lane of traffic already blocked by excavation or open manhole. It should be kept out of open lanes.

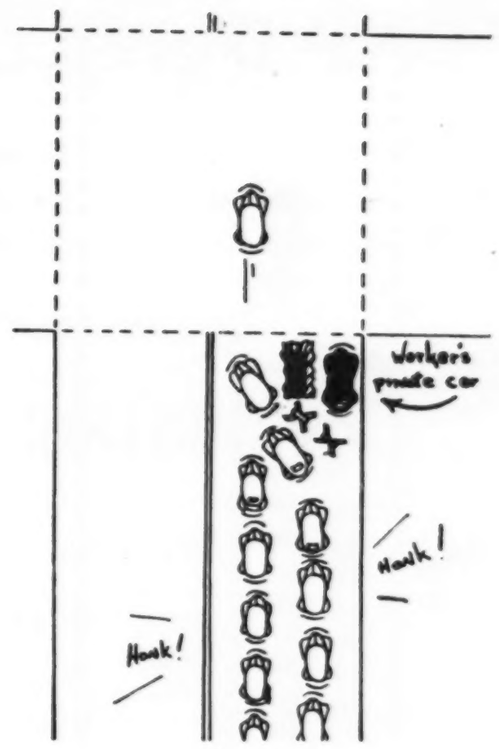


Time Work Performed: Traffic is heaviest on busy streets from 7 a.m. to 9:30 a.m. and 4 p.m. to 6:30 p.m. Every effort should be made to program work in such a manner that traffic interference is at a minimum during these periods, consistent, of course, with the nature of the required work.



Steel Plates: Proper, reasonable use of steel plates will materially reduce interference. Consideration should be given to their use at street intersections to reduce traffic interference by an open trench, when no work is in progress; across an open trench in driveways and on walks to provide safe passage for vehicles or pedestrians when work is being performed; and when no work is being done at noon, nights, Saturdays, or Sundays. The edges of plates should be held by premix firmly tamped as a hazard is often created when the approach is made of dirt. Plates should have angle cleats on the bottom to prevent possible displacement.

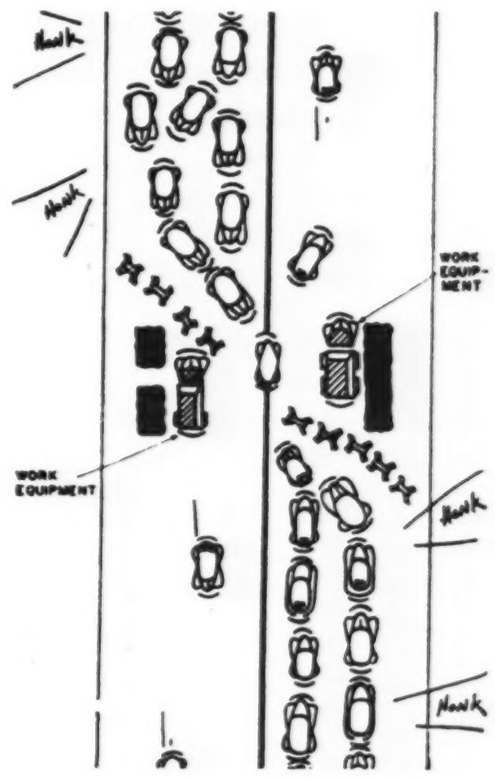
Motor Vehicles: Company work vehicles when not necessary at point of work, especially on heavy traffic flow streets, should be placed on side streets, or in some location where they will not interfere with traffic flow. Employee-owned vehicles should not be parked on busy streets near the point of work, merely for convenience of easy access.

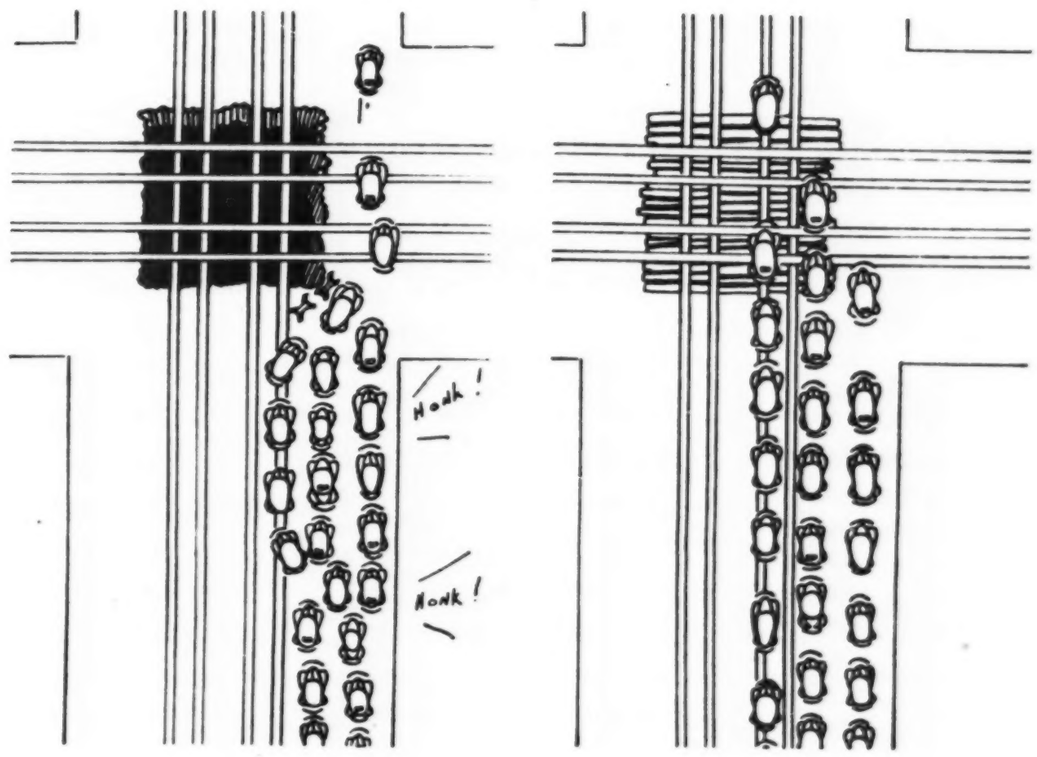


Parking: Drivers of city vehicles, utility vehicles, etc., may not park such vehicles wherever they think necessary with little or no regard to parking regulations. Traffic regulations exempt only police and fire vehicles, and such public utility vehicles as are "*qualified as an authorized emergency vehicle.*" The ordinance also exempts city or public utility vehicles when parked or standing in restricted zones, only when *necessarily in use* for construction or repair.

Working Between Safety Zones and Curbs: Sometimes certain work operations are necessary between an established safety zone and curb. The space is narrow, and on busy streets the blocking of the area, together with the safety zone, interferes with traffic. Plans should be made to block this area for the shortest possible period.

Multiple Street Operations: When work operations by two or more utility or city department groups are going on at the same time on opposite sides of a street in a single block, serious and often unnecessary traffic interference may result. Where such a condition will exist if an additional crew starts operation, work should be held up until the situation has been given consideration by proper agents of the groups involved and the police.





Railway Crossings: Repair work at railway crossings in busy intersections may seriously interfere with motor vehicle traffic. The use of old ties over which oiled gravel has been spread may often be used to speed up traffic around and over the excavations made.

Evaluation of Gas as Baking Fuel

It's best at any price, but burner troubles and underwriter practices must be rectified

By J. EDWARD COAN
Middleby-Marshall Oven Co.
Chicago, Ill.

(Condensed from paper presented at AGA Sales Conference on Industrial and Commercial Gas, Nashville, Tenn., April 5-7.)

IN our opinion, no fuel but gas should ever be used in a mechanical oven—even if the gas has to be imported in bottles. We have always preferred gas because of its constant supply, its cleanliness and its ease of handling, but above all in bake oven use, its making possible a more direct type of heating with consequent much greater flexibility and quick and accurate control response than is possible with any other fuel.

This thinking is not common to all oven manufacturers. Many oven makers, especially those specializing in the larger ovens, plump for a completely indirect-fired system, with products of combustion sealed off from the baking chamber. Almost as a corollary to this, oil is their preferred fuel, except in cheap natural gas territories. To be sure, this picture has changed somewhat in the last few years, because of the fact that other fuels have increased in price far more, relatively, than gas. But note again these ovens are gas-fired, because of lower cost and customer's demand, and not because of the manufacturer's option. The story should be that gas is best at any price, even a low-Btu gas at a relatively high cost.

I know some of the reasons for this resistance to gas on the part of some of the largest oven manufacturers. One reason (a relatively small one perhaps) is the lack of promotion of gas as a *safe* fuel. Some manufacturers and quite a substantial number of bakers think of gas as an explosion hazard and do not so think of other fuels. In our experience, mishandled oil burners are quite as explodable as equally mishandled gas-burners and very likely the percentage on oil is a little higher. But this does not seem to be generally known. I might add that rather remarkably few casualties of this sort have ever occurred on bake ovens, despite the fact that safety controls suitable for oven use have been, until very recently, rather crude and much too slow acting. Only within the past few years have there been perfected adequate safety controls for bakery ovens.

A related but different problem is the somewhat unrealistic attitude taken by large commercial insurance underwriters. Some of their safety requirements for gas-fired ovens are not only a big nuisance, but compliance is all but impossible in some respects. Consequently, some manufacturers find it simpler to use other fuels than to attempt compliance with these demands.

Bad Burners

But a far more potent factor in the resistance to gas by some manufacturers of larger ovens has been that it is easier for them to use a self-contained oil burner unit, or even a coal stoker developed and perfected completely by other companies, than it is for the oven people themselves to struggle with the development of an equally perfected gas burner—*for there is no completely satisfactory gas burner unit suitable for large oven use on the market today.*

Since the coming of age of the mechanical oven, roughly the last 15 to 20 years, with the consequent obsolescence of the stationary or peel type oven, the problem has become much intensified. With the modern automatic oven, the baking process became, for the first time, a precision affair. The crudities of operation inherent in the peel oven are not tolerated in the mechanical oven, and this includes heat distribution. Virtual perfection is expected of a modern mechanical oven. In his peel oven, the baker may have taken for granted playing checkers with his goods, rotating them between cold spots and hot spots. With a mechanical oven, the baker will not tolerate a shade of difference in color from one end to the other of a tray which may be as long as 146 in. There is less difficulty in delivering this uniformity through a sealed indirect system, with heat distributed through flues, than in a long pipe burner.

But with an indirect system, you lose a lot of efficiency; you use at least 20% more gas; you lose very substantially in flexibility, which is one of the most valued attributes of a mechanical oven, especially the revolving tray type. We have therefore stressed heavily the line burner in a semidirect system which is, in effect, a pipe burner enclosed in a long metal and refractory box with the sides knocked out. Two types are used: the air driven or atmospheric types and the motor or power driven type.

Twenty years ago we were told that an atmospheric burner over 3 ft long would not work successfully. We have used them in excess of 12 ft with reasonably good results, but the development has been almost completely up to us as oven manufacturers, and we have had much trial and error and are by no means out of the woods. We have on many occasions attempted to standardize on various commercial burners and have used these for considerable periods of time, but in every instance there have been drawbacks serious enough to cause us to return to our own devices of taking part of this burner, part of that, assembling them, and making up the rest ourselves. We have been unable to get a totally satisfactory complete unit purchased on the commercial market. While we are getting by, the results are still not what they might be. The burner is still the weakest part of the oven.

In summary, the things that would help most are these: (1) A more universal cooperation between a gas company's local offices and the manufacturers, both on sales and on service, and with this a little study by some of the offices of problems specific to bake ovens, which are very different from the simple problems of space heating or the heating of a hot water tank. (2) Inclusion in some of the very excellent AGA publicity of more emphasis on gas as the *safe* fuel. (3) Some work with the insurance underwriters to achieve more realistic and simpler standards and demands. (4) Advice or help, in some form, toward the development of a perfected gas burner suitable for bake oven use. I would like to add a fifth which ties up very closely with some of the previous points: The extension of the services of the AGA testing laboratory to include acceptance of a completely assembled unit such as bake ovens.

Corrosion Products of Zinc Anodes

Study of deposits on buried anodes indicates methods of minimizing their formation

By E. A. ANDERSON
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The New Jersey Zinc Co.
Palmerton, Pa.

(Condensed from paper presented at National Assn. of Corrosion Engineers meeting, Cincinnati, April 11-14.)

WHEN the use of zinc anodes as a source of current for the cathodic protection of buried pipelines was first initiated a number of years ago, the general experience showed that the anodes would initially furnish enough current for protection if the soil had sufficient conductivity. It was found later that the current flow gradually diminished, presumably because of the formation upon the anodes of heavy layers of dense white corrosion products which apparently offered a higher resistance to the flow of current. The absence of this phenomenon was observed in the case of soils which had a high percentage of naturally occurring sulfates usually in the form of gypsum ($Ca\ SO_4.\ 2H_2O$). Based upon this observation, a technique was evolved in which the hole in which the anode was placed was backfilled with a mixture of gypsum and bentonite clay instead of the natural soil. Anodes so installed consistently have delivered a high percentage of their initial current over a period of at least five years at electrochemical efficiency 90%.

Until recently no data were available upon the problems of this behavior of anodes when used with backfill; however, two anodes removed from a soil containing natural gypsum crystals have been examined to determine just what corrosion products are present and to endeavor to formulate a reasonable hypothesis to explain the observation. The two anodes had been installed in a stratum of sub-bentonite clay, which contained an abundance of natural gypsum crystals with natural soil used as a backfill. Anodes identified as C3743 had been one of a group of four installed Oct. 27, 1942. The anode originally had weighed 54 lb and had been in the form of a 7-in. OD tube 36-in. long and a 5/16-in. wall. The tube had been formed by curling rolled strips into the desired shape. The soil resistivity in this area was 550 ohm-centimeters. Current readings were given covering a 6-year period for the four anodes in this group.

Anode C3744 was one of the group installed March 19, 1935. It was similar to anode C3743 except that the wall thickness was ¼-in. and the weight 43 lb. The soil resistivity was 450 ohm-centimeters. Current output with the four anodes in the group of C3744 are presented from March, 1935 to March, 1948. Individual current readings for anode C3744 were measured three times during the test including one reading before and one reading after cleaning in 1939. Examination of anodes C3743 revealed that the cross-section was substantially reduced in most areas, although in a few places little attack had occurred. A heavy white layer of corrosion products was present on the surface; beneath and adjacent to the metal was a gray layer. A similar cross-section of anode C3744 revealed only a very thin film under the white layer. With the exception of a structure photograph, no other work was done with this sample.

In Fragment Form

Since this anode was in the form of a fragment at the conclusion of the test there is doubt as to whether it had been in the electrical circuit during the latter part of the test. Examination showed that the gray layer on anode C3744 was composed of short needles overlapping in such a manner as to create considerable interpenetration voids. These needles were nearly transparent and contained some metallic particles presumably from the anode which may, together with the probable presence of salts and metallic impurities from the zinc, account for its gray color. The white layer was found to be a mixture of a skeleton structure similar to the gray film and a dense white material filling the interstices in the gray structure. The gray layer was identified as basic zinc sulfate by X-ray diffraction examination, and the presence of sulfate was confirmed by microchemical test. The white layer seemed to be basic zinc sulfate from the X-ray examination, but microchemical tests disclosed both carbonate and sulfate.

Chemical analyses were made on both layers. The data regarding the constituents in this gray layer and white layer are in agreement with previous experimental results conducted in the author's laboratory. A tentative explanation is offered for the mechanism by which the two layers were produced. When the anode was placed in the soil, it came into contact with water containing dissolved carbon dioxide and calcium sulfate. As current flows zinc ions enter into solution in the water and migrate a short distance from the anode surface. Hydroxyl, carbonate, sulfate, and possibly other anions transported to the anode surface by the current endeavor to react with these zinc ions. While definite solubility data are not available, it seems probable that the basic carbonate of zinc is less soluble than the basic sulfate. Accordingly, the basic carbonate would be expected to form first, probably as a two-step operation involving the initial formation of zinc hydroxide and the later reaction of this soil with carbon dioxide.

The availability of carbon dioxide is limited by the semi-stagnant nature of the ground water, the point being reached where the reaction with sulfate takes precedence and the basic zinc sulfate starts to form. The high mobility of the anions and the relatively low mobility of the zinc ions suggested that the former penetrate the film to form new film material adjacent to the zinc surface. Thus the outer white layers were formed first and the gray inner layers last. An annual periodicity was indicated by the fact that six laminated layers were observed on the anode removed which had been in service for six years. This may well be connected with seasonal increases in ground water flow during periods of heavy rains. The white bands in the gray layers seemed to be basic carbonate presumably resulting from such seasonal influx of fresh supplies of water containing carbon dioxide. The continuous network of basic zinc sulfate in the white layer may have resulted from cracking during dry periods of previously formed basic zinc carbonate and the subsequent formation of the basic sulfate in the cracks. The dense structure of the basic carbonate and the porous structure of the basic sulfate indicate the desirability of (1) having sulfate present in the environment, and (2) minimizing the access of carbon dioxide to the zinc surface.

Testing Pipeline Coatings

Holiday detectors now developed to give good pipe inspection with minimum danger

By D. E. STEARNS, M. W. BELSON and ROBERT H. LEE

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(Condensed from paper presented at National Assn. of Corrosion Engineers meeting, Cincinnati, April 11-14.)

DESPITE the many years of work and experience associated with the coating of pipelines, coatings still have holidays in a few places following the coating machines and gangs. These holidays have occurred to a lesser extent with the additional experience and knowledge that has been obtained in this field through the past few years of widespread coating application.

Early day coating inspections, which were visible ones, were inadequate since many holidays could allow the passage of a considerable amount of electric current and still be completely invisible to the eye. First attempts at electrical inspection consisted of dragging over the line cloths soaked in salt water which were connected to a battery through a milliammeter. A change in reading was indicated on the milliammeter when a holiday was passed under the cloth. Further attempts were made in the early 30's in electrical inspection using Ford spark coils and other equipment with adaptations of the auto-ignition system wire brush or broom to sweep over the coating. The main defects in these types of inspection were that the only source of a signal indicating a defect was a visible one which may or may not have always been brought to the attention of the operator.

Present day machines also indicate the presence of a holiday by audible means as well as visible signals. The minimum voltage at which adequate inspection may be made is determined by the mechanics of applying the coating and by the thickness of the coating. As an example, a commonly used coating consists of enamel followed by one or more wraps of other materials, such as glass fiber, impregnated felt or the like, and kraft paper. The minimum inspection voltage should be that which would jump an air path equal to the distance through the thickest section.

It is pointed out that because of the conductivity of the ionized air and of the conductivity of the surface of the material, there is a negligible drop in potential at distances up to ½-in. away from the point of impressed voltage. This has a practical application in the use of holiday detectors, for it means that good inspections do not require using d-c voltage, nor the use of an electrode that covers a large area. As the detectors move along, each voltage picked from an a-c wave, or from a pulse wave, inspects a fairly wide band around the pipe, and inspects it at a nearly even voltage.

In practice, it is necessary to have a design center for the voltage-generating equipment high enough that the test voltage will never fall below minimum test voltages. There is nothing to be gained by increasing voltage beyond the point that insures maintenance of the minimum test values and such practice will be harmful because it places an unnecessarily high stress on the dielectric material and could damage good coating. From tests conducted to illustrate the breakage voltage and energy requirements, it was observed that there is a difference in the response of solid insulating material; namely, the breakdown voltage gradient for solid materials is a function of time of voltage application.

To determine exactly how important these factors might be with respect to coating materials, an experiment was run on a coal tar enamel. The experiment gave accurate information on the dielectric strength of the coal tar enamel under test. In the field the coating is never subjected to more than a fraction of a volt of ground potentials; and where cathodic protection is provided, the voltage is only slightly higher. As previously mentioned, because of the thickness of the coating, a high voltage must be used. Since 0.020 in. of good insulating material will effectively protect a pipe from ground currents, there is no object in breaking down such thin points if this can be avoided. The generator used in the coating inspection equipment should deliver a voltage close to the minimum necessary for adequate inspection.

To design equipment capable of such good regulation requires a study of the nature of the load presented to the generator by the pipe including the resistance of the wrapping material which varies with moisture content. Three systems of generating voltage to be delivered to the testing electrode include the 60-cycle sine wave generator, a properly designed magnetic energy storing system, and a third system for generating voltage which takes advantage of the capacity type of load presented by the pipe in a manner which allows for minimum energy drain and minimum weight and size of components. The latter consists of a d-c power source, a reactor, a condenser, and a switch connected in series in such a manner that when the switch is thrown to a closed position, a flow of current will start from the power of source.

The investigation of coating characteristics discussed was utilized in equipment design only during the past few years, and it has resulted in the rapid development of holiday detectors that have close to ideal inspecting characteristics. A detection circuit is utilized which gives clear signals to the operator whenever a holiday is encountered. Weight has been minimized, power consumption has been cut to a minimum. and inspecting pulse has been shortened to such an extent that the time of impressed voltage on the coating is only 0.03% of the operating time to provide for much better inspection of pipe with easier operation and less danger to coating.

Meter Performance

Introduction of mixed gas found beneficial

By W. J. MENET

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The Peoples Gas Light & Coke Co.
Chicago

(Condensed from paper presented at the AGA Distribution Conference, Cincinnati, April 4-6.)

MIXED gas was introduced into our system in October, 1931, and consisted of approximately 45% coke oven gas and 55% natural gas by volume with a heat content of 800 Btu per cu ft. Carburetted water gas and natural gas mixture has been used for peak periods. For emergencies coke oven gas enriched with butane or propane has been used to supplant the basic coke oven gas and natural gas mixture.

From 1930 to 1934 studies of the moisture contents of the gas at points 10 or 12 miles from the sendout stations were made and indicated a very regular yearly variation, controlled by the main pressure and the ground temperature.

This repeats itself year after year.

From 1935 to 1945 an attempt was made to control the moisture contents of the base gas going to the mixing equipment so that the sendout would contain slightly more water vapor than that indicated at certain points at different times of the year. This usually means removing a little moisture in the spring and being a little low on moisture in the late fall. This was believed to be necessary because differences in holder temperature and ground temperature affect the relative saturation of the gas in the mains during these seasons.

Eight special test meters, four new and four repaired, were set in a station in January of 1947 to test the effects of straight natural gas on meters. On Nov. 15, 1948, these meters were brought in for examination and they were all found to test correctly. The diaphragms were found to be in very good condition.

The life of a leather meter diaphragm is at present indeterminate with the gas now distributed in Chicago. Some diaphragms which have been in service for more than 35 years were found in good condition. The age change program was increased from 5 to 7 years in 1920 and finally to 10 years in 1948.

There are 940,000 meters in service in the Chicago territory. The present classification of repair is calculated to produce the following percentage of repairs in a yearly repair program of approximately 100,000 meters.

O.K.	6%
Readjust	23%
Partial	27%
General	44%
Diaphragm	Less than 1%

It can therefore he concluded that in the case of The Peoples Gas Light & Coke Co., the changeover from a straight manufactured gas to a mixed gas has been very advantageous in connection with meter proof and performance.

Preparing Surfaces for Coating

A discussion of methods in use to condition pipe for covering

By O. C. MUDD
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(Condensed from paper presented at the National Assn. of Corrosion Engineers meeting, Cincinnati, April 11-14.)

A good coating for protection against underground corrosion will be obtained on pipe only if the pipe is properly cleaned before the coating is applied. The problem of cleaning pipe economically is of importance to the pipeline operator and to the engineer, particularly when hot bitumen is to be applied to coat or recoat steel pipe salvaged for relaying in new lines, or in operating lines raised from the ground for reconditioning. Some engineers believe that removal of corrosion products down to the base metal—usually a very expensive process—is the only practice that will insure a good coating. However, there are cheaper alternative cleaning and coating application practices that will insure equally good results. Instead of sand blasting rust from steel structures, such as pipes, tanks or bridges, and then following up by a primer coat of other rust mixed with a paint vehicle it is suggested that the tightly adhering silicious materials which resist removal by ordinary cleaning be left on the pipe and chemically treated to drive out moisture and saturate the surface with appropriate inhibitors or priming solutions.

Chemical treatment of machine-cleaned metal surfaces has led to changes in methods for cleaning the exterior of used pipe to give better economy and obtain improved coating results. Brief consideration is given to conventional methods of cleaning pipe such as mechanical cleaning, sand or "grit" blasting and flame cleaning. The former method is most widely known throughout the industry and practically all pipe removed from the soil is given at least one "pass" through a rotary cleaning machine before additional cleaning measures may be used. Sand blasting and "grit" blasting are equivalent to the extent that both dislodge foreign particles by impact or cutting action of extraneous articles. The efficiency of the sand blasting operation is determined by the velocity of impingement of the particles, the angle of particle impingement, and the sharpness of the edges of the sand used in the blasting operation. "Grit" blasting uses hard steel particles about the size of a bird shot. In general, "grit" blasting has been limited to stationary operations. Flame-cleaning has been used occasionally. It is effective for moisture removal, but it has disadvantages of high operating cost, hazards around flammable materials, and localized stressing of metals.

It is thought that high frequency electric-induction heating devices, with the frequency control to give proper depth of metal heating, may have possibilities. A single pass of a traveling-type cleaning machine equipped with knives only, or with knives and cutter wheels, will usually clean uncoated pipe, which may be covered with more or less quantity of earth depending upon the type of soil from which it is removed. Lines which are coated with either coal tar enamel coatings or asphalt enamel coatings may require more than one pass with a knife machine.

Removal of petrolatum or grease base coating requires more than mechanical cleaning. It must, in addition, be washed with rags, soaked in kerosene or distillate. Pipe racked up for yard reconditioning is more susceptible to atmospheric temperature changes than pipe in which gas or oil is flowing and, hence, may be more easily cleaned in cooler weather. Some coatings, such as asphalt emulsions and grease base paints, are removed most successfully by burning. This operation is better done by applying heat from inside the pipe and the pipe should be well supported when the burning operation is in progress. When coating is burned from pipe, the surface should be heated enough to carbonize any remaining films provided such temperature does not damage the pipe.

A development of chemical treating during several years of pipe reconditioning has shown the advantage of its substitution for additional mechanical cleaning. First experiments were prompted when sand blasting of pipe failed to provide a satisfactory bond for asphalt enamel. Dilute primer was applied to freshly sand blasted pipe to prevent moisture collection and oxidation. A similar primer application was then tried over extensive lengths of machine-cleaned pipe. The bond of the hot asphalt improved, and fewer holidays occurred because the dilute primer had removed the moisture from tightly adhering corrosion products, including such as remained in small deep pits. A simple test will prove that moisture or water can be removed from corroded surfaces by dilute primer.

Dilute primer probably does not remove all moisture from the remaining corrosion products, but it reduces the amount to where it causes practically no trouble with hot bitumen applications. Also, chemicals are available which will insure removal of all moisture. These are mostly amines, such as used in rust inhibiting oils and greases. The addition of corrosion inhibitors

may be desirable also. Tests under actual service conditions will answer the question as to their value. Cleaning pipe surfaces during reconditioning is costly, therefore, the available methods of cleaning should be analyzed as to effectiveness and cost before starting a job. Use of dilute primer reduces the amount of mechanical cleaning necessary, and it materially improves the coating bond. Water repellent and corrosion-inhibiting chemicals added to the dilute solution will improve its dehydration properties, but such can be justified only if the advantage is worth the cost.

Gas Conditioning

Careful planning ahead of changeover needed

By M. ANUSKIEWICZ JR.

Engineer of Development & Planning
The Brooklyn Union Gas Co.

(Condensed from paper presented at the AGA Distribution Conference, Cincinnati, April 4-6.)

FOR those companies anticipating the use of natural gas, gas conditioning —such as oil fogging or humidification— is a phase of major importance which cannot be ignored or left for development at some future date. Detailed studies should be made of the existing distribution systems, particularly in reference to the following points:

Types of mains in use.
Conditions in existing mains.
Gas pressures and velocities, considering both present and anticipated conditions.
Relative humidity, under present conditions, in all parts of the system.
Present dust and leak problems.
Proportion of manufactured gas, if any, to be used.

Local situations will determine the extent of conditioning required. Although extremes cannot be recommended, it would be well initially to over-condition rather than under-condition. Insufficient initial treatment may well result in costly expenditures to eliminate leaks which are beyond treatment, and in excessive service calls because of dust.

Carboseal has proved an effective means in reducing joint leaks, provided that such joints have been properly made and have not been permitted to dry out.

Oil scrubbers are recognized as an effective means of cleaning gas before it is introduced into the system. Traps, particularly of the filter type, are an effective means of removing dust at district regulators.

Standards Requirements Overhauled

AGA announces changes in water and room heater, range specifications

Adopted by the approval requirements committee at its March 15 meeting, modifications and simplification of requirements, under the AGA Laboratories approval plan, to American standards for domestic gas ranges, water heaters, room heaters, hot plates and laundry stoves, gas hose for portable appliances, and gas valves will become effective Jan. 1, 1950.

Specification requirements covering the certification of gas ranges, water heaters, room heaters, hot plates, and laundry stoves for use with LP-Gas-air mixtures were established for the first time. Pending establishment of similar requirements for other types of gas-fired appliances, certification may be extended to them also for use with LP-Gas-air mixtures on the same basis as set up for the specific appliances covered in the new requirements.

Under the new standards use of two test gases are specified. These are known as "Gas F" and "Gas G." Satisfactory performance on both is required, although a change in main burners and pilot burners as well as readjustment of orifice and primary air settings for each test gas is permitted. Gas F is a 525-Btu butane-air mixture of 1.16 sp gr. Gas G is a 1400-Btu butane-air mixture of 1.42 sp gr. Choice of burners to be used on equipment utilizing intermediate heating value mixtures is left to the option of the manufacturer as his experience dictates.

The revised water heater requirements are devoted principally to simplification and revision of the old text. New addenda to existing gas range requirements clarify the wash boiler test procedure, permit the approval of ranges incorporating single point ignition systems, and modify the requirements for the use of non-ferrous metals for top burners, requiring metals of greater durability. Similar wash boiler and top burner provisions were incorporated into the hot plate and laundry stove requirements.

Revisions made in current space heater requirements provide for changing their title. The term "Room Heaters" is considered more appropriate to the function they perform and avoids confusion with newer types of equipment appearing on the market. A room heater is defined as follows:

A self-contained, free standing, non-recessed, (except as noted below), gas-burning, air heating appliance intended for other than major domestic heating. This shall not include air heating appliances covered by other American Standard Approval or Listing requirements. A room heater may be of the vented or unvented type, except that unvented room heaters shall not have a normal input rating in excess of 50,000 Btu per hour. (Note: This classification shall also include unvented *open flame radiant* type wall heaters.)

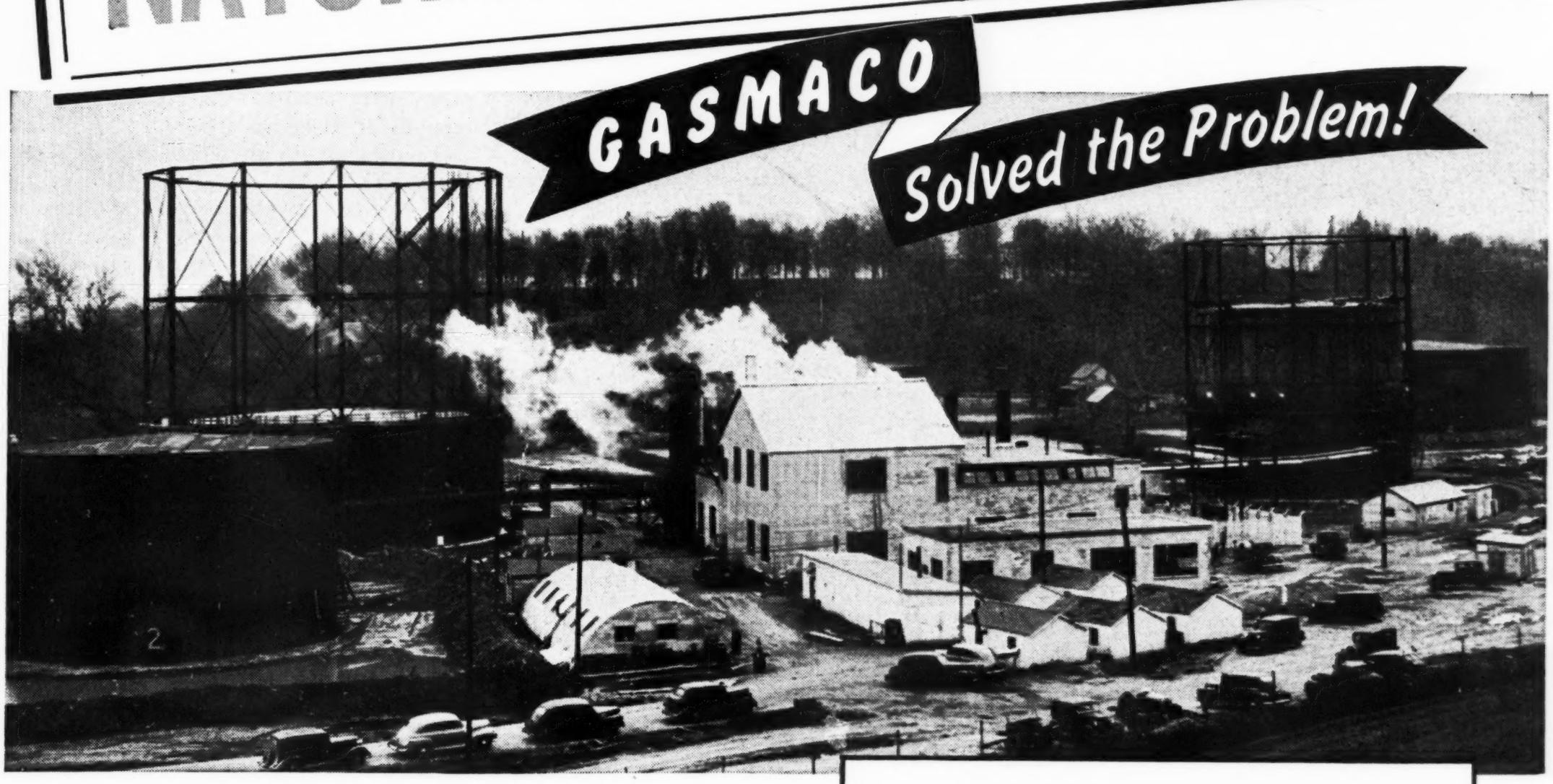
Requirements for flexible gas tubing were extensively revised. They will be known in the future as "Listing Requirements on Gas Hose for Portable Gas Appliances," to avoid confusion with connectors of flexible metal tubing and connectors of semi-rigid tubing which are tested under separate requirements.

Addenda were also adopted to current standards for gas valves. These cover recommended dimensional specifications for boundary and fitting points intended to promote standardization, uniformity, and interchangeability along the standard lines of each manufacturer and yet permit the manufacture of special types.

A number of other important actions were taken by the approval requirements committee for the purpose of improving various standard procedures and streamlining the functioning of subcommittees. One was the establishment of a procedure for motivating the certification of appliances and accessories for which definite standards or requirements have not been adopted. For example a gas-fired chicken brooder, or weed killer or popcorn popper does not fall within a generic classification for which standards already have been established. Handling of requests for approval of such equipment was assigned to the subcommittee on standardization of requirements, which will also formulate recommendations to the approval requirements committee as to possible certification, specifying what tests should be employed and how they should be conducted. Appliances falling within the generic classification but employing novel construction not covered by existing test methods will continue to be reviewed by the subcommittee responsible for the existing standards.

Because of lack of activity, four sets of requirements—on private garage heaters, industrial gas boilers, and low water cut-off devices—were withdrawn and similar action on the part of the American Standards Assn. Inc. was recommended.

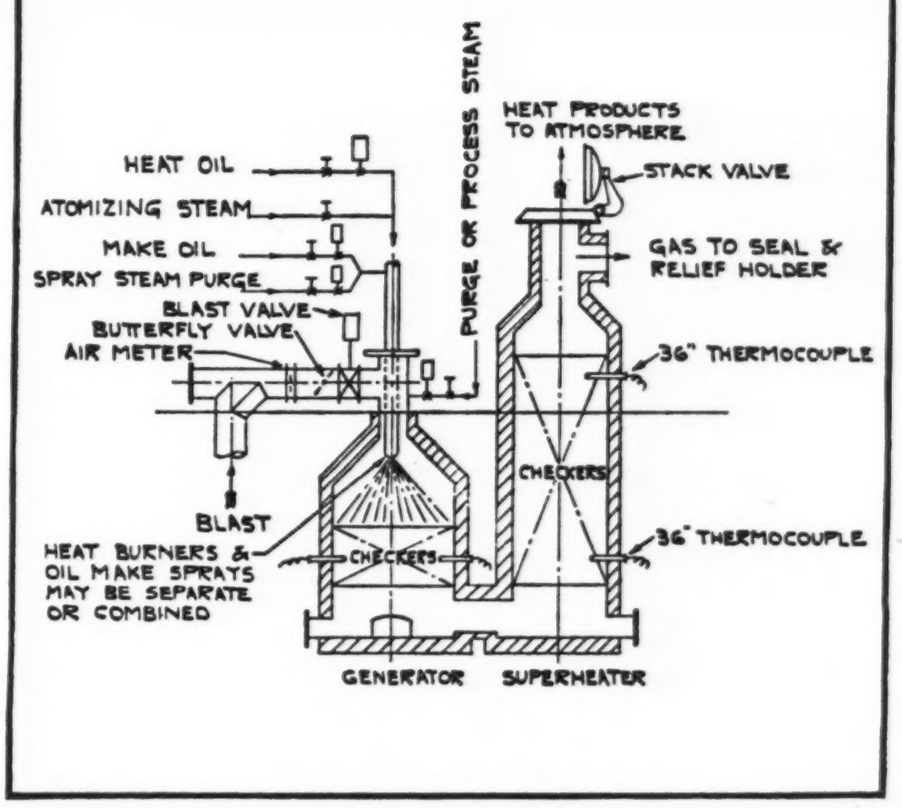
Hi-BTU OIL GAS REPLACES NATURAL AT PORT STANLEY



● Here is another outstanding example of *HI-BTU Gas to the rescue:* For years the Dominion Natural Gas Company had been faithfully serving communities on the northern shore of Lake Erie and intended to continue this service. But increasing consumer demand and declining natural gas supplies posed a problem. An existing stand-by propane plant was not enough . . . THE ANSWER: HI-BTU Oil Gas as developed by The Gas Machinery Company of Cleveland. Starting in a cornfield early in 1948, a completed plant was making 1,000 BTU Oil Gas in November of the same year.

This may be the answer to your peak load and stand-by problem. *And you do have a problem!*

Write to us for the complete story of this installation.

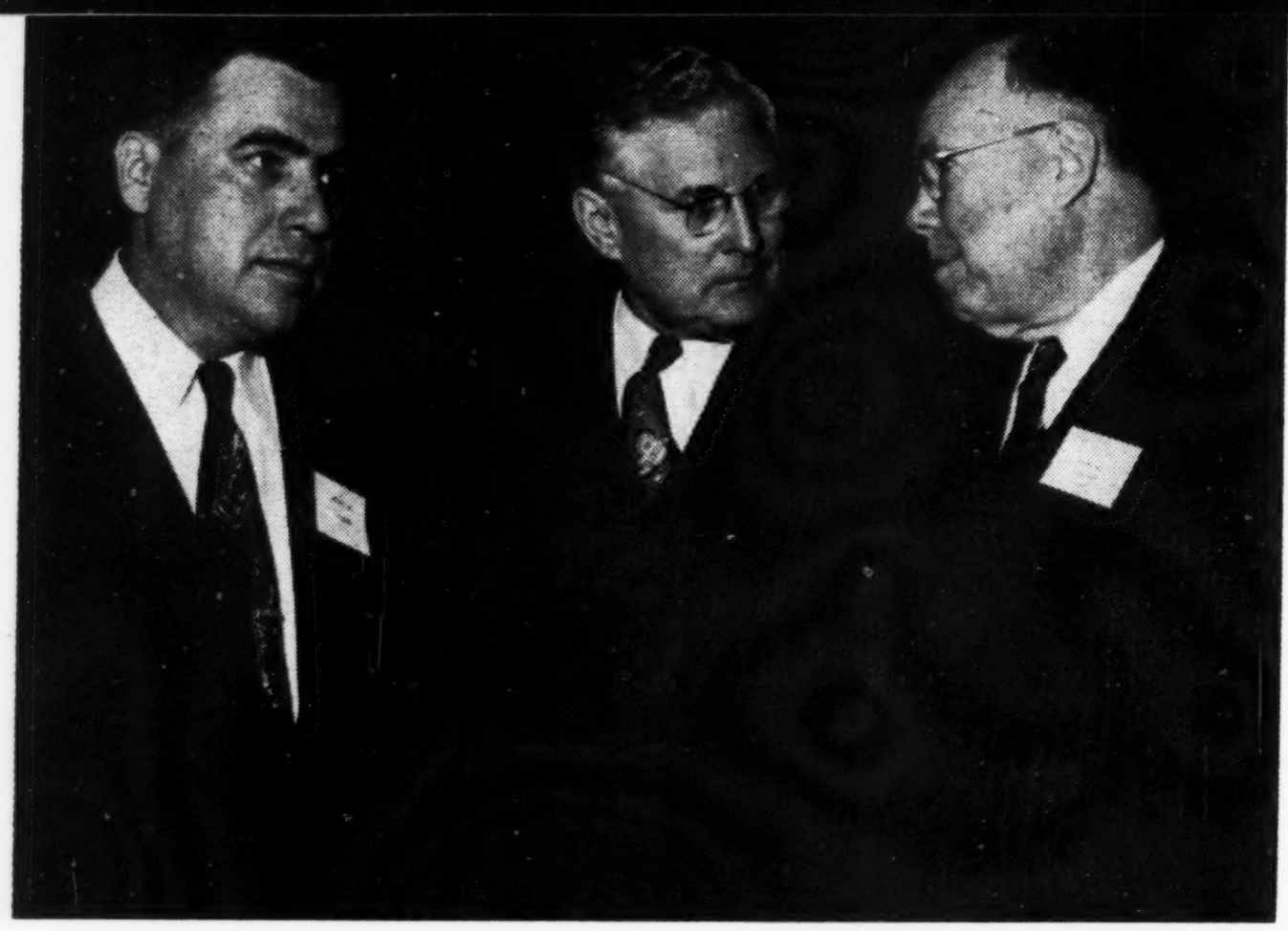


HI-BTU Oil Gas Process
Patent pending

THE GAS MACHINERY COMPANY

16108 WATERLOO ROAD
CLEVELAND 10, OHIO

Designers • Fabricators • Erectors
Gas Plant Equipment and Industrial Furnaces



LOOKS SERIOUS. In the top photo, Edwin L. Hall, left, director of the AGA Testing Laboratory, Cleveland, and W. G. Rogers, vice president, The East Ohio Gas Co., listen as Max W. Ball, Washington consultant, talks. All three were on the natural gas meeting program, Mr. Hall delivering a paper on catalytic reforming and cracking, Mr. Rogers introducing his company's movie, and Mr. Ball, ex-director of the Interior's Oil and Gas Division, speaking on gas storage.

LIGHTER VEIN. James S. Moulton, vice president, Pacific Gas & Electric, San Francisco; Clifford Johnstone, managing director, Pacific Coast Gas Assn., and Fred Hough, vice president, Southern Counties, Los Angeles, enjoy a hearty laugh. Mr. Hough's talk on "Pipe Batteries" was a high spot of the meeting.

INTERLUDE. Between meetings, busy George Smith, Natural Gas Department director, at left, chats with Glenn Clark, vice president, Cities Service Gas Co., Oklahoma City, who brought members up to date on legislative developments.

ASSOCIATIONS

Texas Report

Development in greatest producing area told at natural gas meeting

THE governmental, engineering and human relations aspects of the forward march of natural gas, the world's ideal fuel, occupied the attention of the 550 who gathered at the French Lick Springs hotel in Indiana for the AGA Natural Gas Department's spring meeting, May 9-10.

Two developments in Texas of vital interest to the industry were among a score of important matters covered by William J. Murray Jr., chairman of the Railroad Commission of Texas in an address on "Natural Gas Problems in the Territory of Greatest Reserves."

The first development was legislation which would instruct the Texas Railroad Commission to actively oppose any additional interstate pipelines which would export gas from Texas. The second was a bill defining standard cubic foot of gas.

While not giving his personal opinion, Commissioner Murray pointed out that many Texans feel a keen concern over the rapid increase of volume of gas exported from the state. As of the meeting date, the resolution in opposition to the additional interstate pipelines out of Texas had passed the Texas house of representatives and was awaiting action in the senate.

Meanwhile a bill defining a standard cubic foot of gas and requiring it to be used as the basis for all measurements also had passed the Texas house and was pending before the senate. The measure received active support of the Texas Independent Petroleum Producers & Royalty Owners Assn.

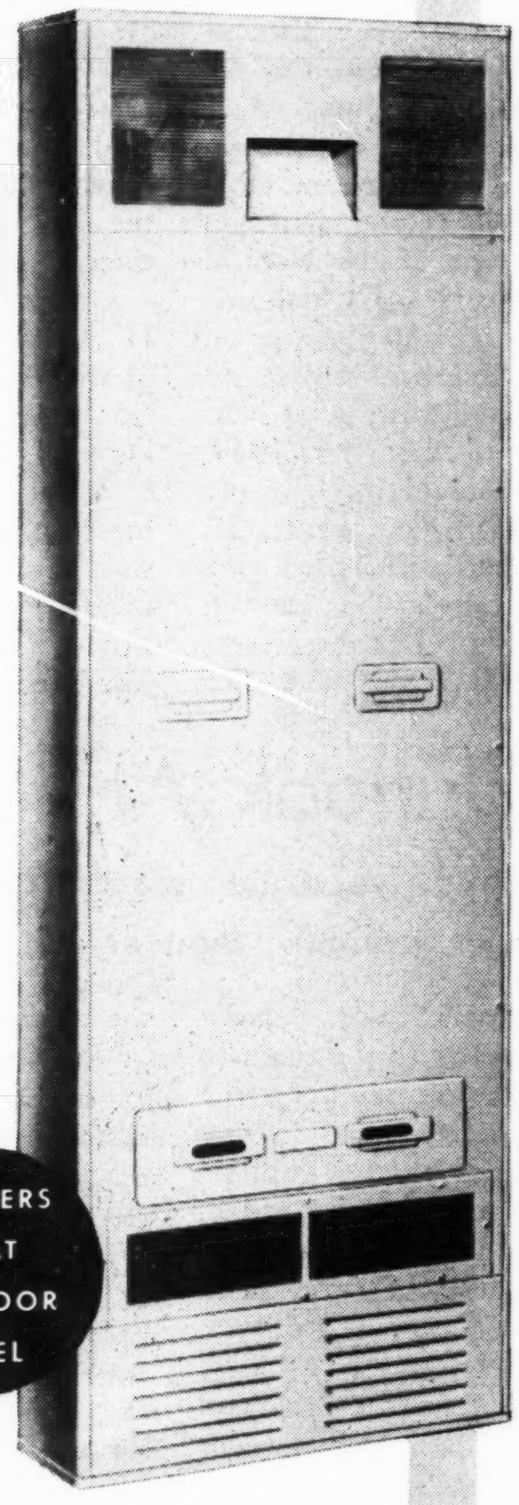
Discussing prevention of waste, Commissioner Murray pointed out that in order to prevent serious loss of oil, it is frequently necessary to place stringent restrictions on production of natural gas from the gas cap of an oil reservoir. He predicted more stringent restrictions in the future.

Commissioner Murray paid tribute to the American gas industry for having voluntarily cooperated with oil producers in an enormous gas conservation program. He said he recognized that the industry was going to be inconvenienced by the necessity of taking a considerable portion of its requirements in the form of casinghead gas.

Among the outstanding papers presented at the meeting was "Pipe Batteries, A Study of the Comparative Costs of Storing Natural Gas in Conventional Holders, and in Pipe Holders and Bottle Holders," by F. A. Hough, W. C. Mosteller, and R. O. Randall, of Southern Counties Gas Co. of California.

The paper was based on an engineering and economic study made by the engineering departments of Southern California Gas Co. and Southern Counties. The conclusion was reached that under some conditions a very large saving in the cost of storing natural gas in holders can be effected by the use of pipe bottle holders.

The first day's general session at the meet-


CAN BE HIDDEN IN WALL
ADAPTABLE TO ANY FLOOR PLAN
FULL AUTOMATIC CONTROL
4-DIRECTION HEAT OUTLETS
DELIVERS HEAT AT FLOOR LEVEL

Panelair provides the selling power of low-cost forced air heating

The Payneheat dealer holds the strongest possible competitive position . . . *the ability to deliver the kind of heating most buyers want, at a price they can afford.*

Panelair *forced air* heating is the answer . . . the *right* answer to the desires of countless people because Panelair supplies all the essentials . . . automatic *forced air heat . . . low first cost . . . extremely low cost operation.*

Panelair's twin 2-speed fans deliver warmed air at *floor level,* directly to 3 or more rooms, ending cold floor discomforts. Panelair can be partly or fully hidden in a wall, placed in a corner or against a wall. Operation is fully automatic.

Panelair makes possible great savings over ordinary wall heaters . . . such as elimination of furnace room in new construction . . . replacement of costly sheet metal work with simple through-the-wall ducts . . . and in other ways.

In operation, Panelair brings fuel savings up to 20% over ordinary wall heaters, owners report . . . due to its 80% efficiency—same as for forced air units . . . and the greater effectiveness of *floor level* heating.

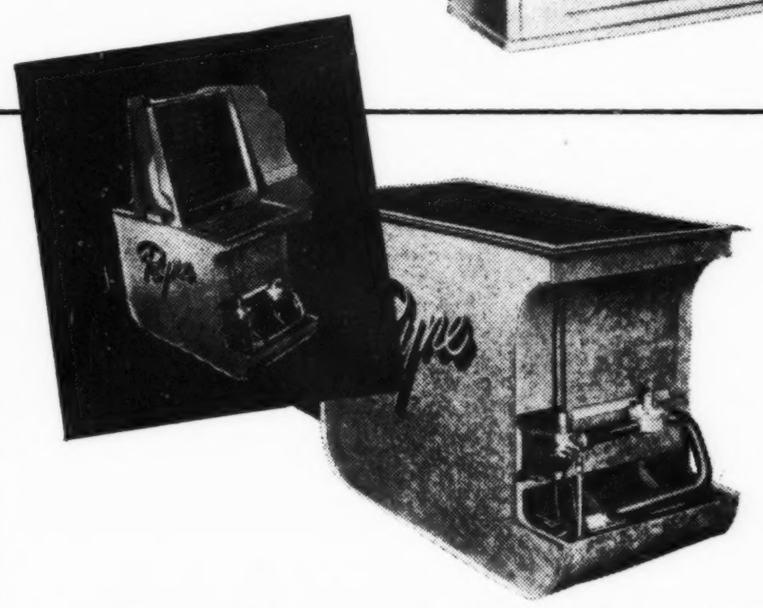
Add up all these factors and the result is a *selling opportunity without precedent in the heating field!*

There's a Payne Unit to Fit Every Heating Need and Budget

For non-basement homes —	*For any home —*	*For basement homes —*
PANELAIR (forced air)	**COMPACT FLOOR FURNACE**	**ZONEAIR** (forced air)
SENTRY (forced air)	**COMPACT DUPLEX CONSOLE**	**GRAVITY FURNACE**
SPACESAVER (forced air)		

The Payne line is so complete you can fit each customer with the *right* unit for best results at least money.

Payneheat is accepted generally as the best there is . . . the result of nearly 40 years strict adherence to the principles of advanced engineering, finest materials, precision workmanship, dependable operation.



NEW PAYNE FLOOR FURNACE

The *"Compact"* Introduces Score of Pace-setting Features like these . . .

- Requires no pit . . . only 23 7/8" deep, yet engineered to give faster, more uniform heat circulation.
- Exclusive Uni-Section heating element . . . guaranteed for 10 years.
- Available with fully automatic controls.
- All cleaning and adjustments from above the floor.
- Waterproof casing protects against floods to 6 inches above ground.
- Air-Flow grille of Duplex directs heated air as far as 2 feet from wall . . . keeps walls cleaner.
- Costs less to own due to low first cost and low maintenance.

Mail coupon for literature on new "Compact"

Every Payne Unit is Safety-Vented. No Sweating of Windows or Walls. No Combustion Products to Breathe.

The facts about Payne opportunities are worth knowing . . . MAIL NOW

Payneheat — GREATEST NAME IN HEATING

G-6

PAYNE FURNACE DIVISION
Affiliated Gas Equipment, Inc.
Beverly Hills, Calif.

Please send me —

- ☐ Panelair Plan Book
- ☐ Literature on Compact Floor Furnace
- ☐ Facts about Payne opportunities

NAME_____

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CITY_____

ZONE____ STATE_____

ing was opened by D. A. Hulcy, chairman of the Natural Gas Department of AGA, second vice president of the AGA and president of Lone Star Gas Co., Dallas.

Mr. Hulcy introduced R. W. Hendee, president of the AGA and of Colorado Interstate Gas Co., who pointed out that in the gas industry today harmony exists to a very satisfactory degree. Mr. Hendee predicted a terrific struggle for the consumer's dollar in the months and years ahead. He pointed to the growth of natural gas reserves as an encouraging trend for the industry.

A forceful as well as entertaining speaker from Washington, Arch N. Booth, general manager of the Chamber of Commerce of the United States, held attention with his warning about the necessity to stop the trend toward socialism.

Mr. Booth expressed the view that the country is living in a "grabistic" rather than capitalistic economy.

Socialism is being cooked up, he declared, and it's what the country is going to get unless something is done about it. He warned of the proposed government medical program, quoting a writer as saying a similar program had made New Zealand a nation of hypochondriacs, and could lead to "weeping, wailing and nationalization of teeth."

Mr. Booth warned his hearers also of the dangers of the Spence Bill, modeled, according to some, after the Soviet bill that set up the five-year plan.

The second day's general session was featured by three papers dealing with "Storage of Gas to Meet Peak Loads." In addition to Mr. Hough's paper on pipe batteries, Max W. Ball, of Washington, D. C., former director of the Oil and Gas Division, Department of the Interior, discussed the "Economics of Underground Reservoirs," and A. B. Lauderbaugh, chief gas engineer, The Manufacturers' Light & Heat Co., Pittsburgh, discussed propane.

Summarizing, Mr. Ball said that if he were advising anyone about storage, he would say:

"Don't go in for storage because it is fashionable; don't go in for storage unless it is smart. Our womenfolks don't always know it, but being fashionable and being smart are often not synonymous.

"Don't make up your mind about storage until you have studied the economics of your situation. You may find that it would do you no real good. You may find that it could do you more good than you had thought.

"If you find that it could better your economics, then go hunting for it, and don't think you must stay within sight of a present field."

Those at the meeting saw two new color films, each a different approach to public relations. The first, "Our Silent Partner," was produced by The East Ohio Gas Co., Cleveland. Designed at first for school children, the film gives a good overall picture of the service of gas from its production through to final use.

In his introductory remarks, W. G. Rogers, vice president of East Ohio, explained the film had been particularly angled at boys, since there are other programs of the homemaking sort of interest to girls.

It has been found, however, that the film also has a strong appael to adults.

The second film, "The Biggest Inch," produced by H. C. Price Co., Bartlesville, Okla., tells dramatically the story of the building of that line, with the running narrative by one of the men on the job, from his viewpoint.

The general story of "Catalytic Reforming and Thermal Cracking was" told by Edwin L. Hall, director of the AGA Testing Laboratories in Cleveland, as the introduction to the symposium on "Peak Load Problems."

In addition to the general sessions, the accounting committee had an open round-table conference, at which F. W. Peters, chairman of the accounting committee of the Natural Gas Department and treasurer of Oklahoma Natural Gas Co., Tulsa, read the report on the meeting of the AGA Subcommittee on Accounting for Underground Storage of Natural Gas, held in Detroit, April 14, 1949.

In a presentation sponsored jointly by the accounting and transmission committees, H. O. Buoen, special accountant in charge of personnel of Oklahoma Natural Gas Co., showed visual aids in his company's plan for business indoctrination of employees.

Indoctrination consists of a 19-lesson course, for which slides are provided presenting salient facts in words and pictures which can sink in visually while the man giving the talk goes into more detail. The whole range of what a new employee should know is covered, including the story of the company's growth, production and distribution of gas, the customer's viewpoint, and the sources of the company's investment dollar.

Officers in charge of the meeting included D. A. Hulcy, chairman, second vice president of the AGA and president of Lone Star Gas Co., Dallas; and George H. Smith, director, assistant managing director of the AGA.

A large number of ladies attended the meeting, and a highly successful bridge party was held Monday afternoon, the committee consisting of Mrs. R. W. Hendee, chairman; Mrs. D. A. Hulcy, Mrs H. Carl Wolf, and Mrs George H. Smith.

Financial Outlook At Its Peak

Natural gas pipeline securities market good, Chenery tells measurement men at school

"The natural gas industry enjoys advantages over its competitors at this particular moment in that it is possible to finance a complete new interstate gas transmission line by the sale of its securities to the public," said C. T. Chenery, chairman of the board, Southern Natural Gas Co., Birmingham, Ala., in the principal address at the Southwestern Gas Measurement Short Course, Norman, Okla., April 12-14.

The speaker declared that markets and securities follow trends. Today natural gas securities can be sold in large volumes. "Perhaps tomorrow the public appetite will be sated and construction programs which can be financed at the moment will be completely impracticable."

"In view of its many advantages over other fuels," Mr. Chenery continued, "it is not surprising that actual sales of natural gas in 1938 were one trillion, 185 billion cu ft, and in 1947 were 2 trillion, 515 billion cu ft, with the forecast for 1952 set at 3 trillion, 900 billion cu ft."

Expressing the opinion that there will be a 30-year reserve of gas, Mr. Chenery predicted that the present efforts to make a high-Btu coal gas for pipeline transmission will be successful and the cost of such gas can be brought within economic limits. He said that the increasing price of gas in the field tends to conserve the supply of gas.

"Good gas maintenance men are made, not born," declared C. D. Attaway, Arkansas Fuel Oil Co., Shreveport, La., addressing the general assembly of the school. "In training such an employee, tell him how to do the job, show him how, let him do it himself, and then have him repeat back to you what you told him," the speaker said.

C. E. Terrell, Birmingham, Ala., retiring chairman of the general committee, told of the growth of the Southwestern Gas Measurement Short Course from a registration of 60 at the first course in 1924 to 929 at this year's school, the largest attendance in the history of the short course.

W. H. Carson, dean of the school of engineering, University of Oklahoma, and chairman of the committee on arrangements for the course, told about the aims and operations of the short course and also introduced Dr. G. L. Cross, president of the University of Oklahoma.

George E. Greiner, Phillips Petroleum Co., Bartlesville, Okla., enumerated some of the products made from natural gas and told about some of the technical papers and studies prepared by the committee on study of practical methods of which he is chairman, including this year's principal printed report on "Condensed Outline of Supercompressibility Determination Methods."

Four fundamental papers were presented, illustrated with illuminated slides, during the general sessions held each forenoon. They were "Fundamental Gas Laws," by E. F. Dawson, University of Oklahoma; "Fundamental Principles of Displacement Meters," by F. Whitworth, Sprague Meter Co.; "Fundamental Principles of Orifice Meters," by L. H. Spink, the Foxboro Co. Inc., Foxboro, Mass., and "Fundamental Principles of Regulators," by J. J. Delaney, American Meter Co., Alhambra, Calif.

On the final day W. H. Woods, chairman of the program committee for 1949, was elected chairman of the general committee to have charge of the 1950 short course. Mr. Woods is gas engineer for the Gulf Oil Corp. at Houston, Texas. He has served for the past 10 years as chairman of each of the committees of the Southwestern Gas Measurement Short Course.

Prizes were awarded at the short course to those who wrote the best papers on, "What I Learned at the Southwestern Gas Measurement Short Course Last Year." They were: First prize—$25, W. H. James, Lone Star Gas Co., Dallas; second prize—$15, Joe J. Hickey, United Gas Corp., New Iberia, La.; third prize—$10, G. W. Nickell, Phillips Petroleum Co., Penwell, Texas; four fourth prizes—$5 each to Jim Berling, Texas Gulf Sulphur Co., Newgulf Texas; Glenn E. Graef, United Gas Pipe Line Co., San Antonio; James W. Smith, Peoples Natural Gas Co., Ralston, Nebr., and E. T. Rogers, the Shamrock Oil & Gas Corp., Amarillo, Texas.

ASSOCIATIONS

Biggest and Best

Attendance record set at impressive SGA convention

THE rapid present progress of the gas industry, and plans for accelerating this headway through sound new methods and aggressive promotion were topmost in speeches and thinking, as the Southern Gas Assn. hit another record attendance at its 41st Annual Convention at Biloxi, Miss., April 20-22.

How to preserve American freedom against enemies at home and abroad, and how to strengthen the American free enterprise system were other topics covered with practical plans by speakers.

With L. L. Baxter, Arkansas Western Gas Co. and incoming president of the association presiding, a capacity general session audience heard a team of prominent leaders from far corners of the country give a dramatic report on how the industry stands today on its unprecedented cooperative effort—the PAR plan.

Robert A. Hornby, chairman of the PAR committee and vice president of Pacific Lighting Corp., San Francisco, described the plan as "one of the purest examples of private enterprise helping itself to better its future and its service to its customers and to this country."

Among the other achievements of the program, Mr. Hornby said, has been the impression it has made on the financial world.

"We are no longer the industry whose future is in its past," he said.

Taking up "P" and "A," standing for promotion and advertising, Hugh H. Cuthrell, chairman of the general promotional planning committee, PAR plan, and vice president, The Brooklyn Union Gas Co., paid tribute to the South for its part in getting the program started. During the first three years, he pointed out, the promotional committee, with D. A. Hulcy, president of Lone Star Gas Co. (Dallas), as chairman, and the national advertising committee, with Carl Wolf, then president of Atlanta (Ga.) Gas Light Co., as chairman, "began and carried on their work in a most effective fashion—so the honor of first getting the wheels rolling went to the southland."

Reviewing in detail the impressive results under the "P" and "A" headings, Mr. Cuthrell mentioned work with motion picture producers as one of many instances of what has been accomplished.

Talking on "R" for Research, Edward P. Noppel, chairman of the general research planning committee, PAR plan, and general consultant, Ebasco Services Inc., said that in the first five years of the research program, the following were among things learned:

How to make high-Btu oil gas from heavy oil; and how to reform hydrocarbons in various forms ranging from natural gas to and including gasoline—two answers to the peak load problem; a quick and accurate means of evaluating oils for carburetion; a great deal about how mixtures of gases burn on appliances (that is, interchangeability).

HIERARCHY. New headman of the Southern Gas Assn. is L. L. Baxter, Arkansas Western Gas Co., Fayetteville, left, while Carl H. Horne, Alabama Gas Corp., Birmingham, was elected vice president at the SGA annual convention at Biloxi in April.

HONORS. Streuby L. Drumm, left, hands honorary life membership to Rudolph M. Schmidt, gas service department, New Orleans Public Service Co., in recognition of achievements in the gas field. Mr. Drumm was awards committee chairman.

How to improve appliances—better adaptability to modern kitchen arrangement and great dependability of operation. How to prevent port clogging, dust closure; how to make better broilers and ovens; how to reduce grate height; what to do about galvanic corrosion in water heaters.

A great deal about house heating—venting, operation, and heat transfer; how to improve coffee urns and steam tables; better means of kitchen ventilation and facts about humidity in the home.

How industrial gas heating compares with induction heating; factors involved in enormous heat release through new types of gaseous combustion; how to avoid hydrate stoppages in natural gas transmission lines; much about nitrogen removal from natural gas.

In an inspirational talk on "It is a Pleasure to Live on Front Street," D. A. Hulcy, president of Lone Star Gas Co., Dallas, and vice president of the AGA, reviewed the great progress of the gas industry in recent years in winning the esteem of the public.

An important reason, in Mr. Hulcy's opinion, for the present fine standing of the

industry is its reputation for being a good citizen of the communities in which it operates.

Wister H. Ligon, outgoing president of the association and president of Nashville (Tenn.) Gas and Heating Co., predicted $3.3 billion will be spent in capital investment by the natural gas industry within the next five years.

He noted that 82% of natural gas resources are in the South.

Mr. Ligon mentioned the possibility that some natural gas companies in the South might soon have to increase consumer prices.

Managing director Robert R. Suttle announced that registration at the meeting had reached the total of 977, another record. Mr. Suttle noted that the association had grown from 18 gas companies and one manufacturer to 57 gas companies and 102 manufacturers, with an individual membership of more than 1000 in the past three years.

In recognition of long and outstanding service to the gas industry, Norris C. McGowen, president of the United Gas Corp. and subsidiaries with headquarters in Shreveport, La., and Rudolph M. Schmidt, of the gas service department, New Orleans Public Service Inc., were presented with honorary life memberships in the Southern Gas Assn.

Mr. McGowen has been chairman of the AGA's committee on natural gas reserves since 1945 and was a member of the Petroleum Industry War Council.

Mr. Schmidt, who has been associated with the gas industry in New Orleans since 1898, is the inventor of several types of laundry stoves and commercial gas ranges which are widely used.

Presentation was made by Streuby Drumm, sales manager for New Orleans Public Service Inc., who is chairman of the association's honorary memberships and awards committee.

In addition, plaques in appreciation of their service were presented to J. H. Collins Sr., of New Orleans Public Service Inc., chairman of the operating section; J. M. Lynn Jr., of Lone Star Gas Co., chairman of the sales section; John B. Cookenboo, of Houston Natural Gas Corp., chairman of the accounting section; and R. A. Puryear Jr., of Alabama Gas Corp., Birmingham, chairman of the general convention committee.

Leonard L. Baxter, president of the Arkansas Western Gas Co., Fayetteville, Ark., was elected president. Carl H. Horne, Alabama Gas Corp., was elected first vice president.

Lyman L. Dyer, Lone Star Gas Co., Dallas, was named second vice president, and H. V. McConkey, Southern Union Gas Co., Dallas, and E. T. Anderson, Atlanta Gas Light Co., were named treasurer and secretary, respectively.

Appointed to the association's board of directors for three-year terms were Murray Hitchock, American Meter Co., Atlanta; Floyd Carmichall, Lone Star Gas Co., Fort Worth; Hayden C. Frizzell, Texas Southeastern Gas Co., Bellville, Texas; L. A. Farmer, Northern Oklahoma Gas Co., Ponca City.

Among the many highlights of the convention were:

The warning by Prof. Amos E. Neyhart, head of the Institute of Public Safety of Pennsylvania State College, that unless street accidents are reduced, vehicle operators may be penalized by restrictive legislation . . .

Advocacy of a basic dealer - serviceman's manual, containing the designs, data, and best installation and service practices for all gas appliances, by Dwight W. Baker of Oklahoma Natural Gas Co., Tulsa . . .

Statement by John J. Bourke, director of commercial gas cooking promotion for the AGA that "the gas industry doesn't need to capitalize on any imaginary features in its advertising, since we have plenty of real advantages" . . .

Prediction by Gay Carroll of Humble Oil & Refining Co. that accountants will assume higher positions in management of gas companies, and his statement that the greatest challenge to the accountant is preparation of understandable, non-technical financial statements . . .

The series of slide films on "Cutting Costs," showing more efficient methods, equipment, ideas and gadgets in use by SGA member companies—129 in all—presented by C. H. Zachry, sponsor, of Southern Union Gas Co., assisted by J. F. Holmes of New Orleans Public Service Inc. . . .

Statement of Dean A. Strickland, general sales manager, United Gas Corp., that: "If we can impress our dealers with the cold, hard facts of more profit in gas ranges than in any other appliance, they will become more interested in selling more gas ranges" . . .

The talking water heater of Stanley C. Gorman, promotion director of GAMA's gas water heater division . . .

The report by Miss Jessie McQueen, home service counsellor for the AGA, that more than 1200 home service representatives are now active with gas utility companies, an increase of 300 in the last three years, bringing home service strength up to its prewar level . . .

The experiment to determine factors affecting the relationship of temperature and daily winter load, reported on to the distribution session by C. B. Gamble Jr. and J. S. Corothers of Alabama Gas Corp. . . .

The detailed analysis of "Practical Corrosion Control on Gas Transmission Lines," by G. R. Olson and H. V. Beezley of United Gas Pipe Line Co.

Hints by Basil J. Whitley of Tennessee Gas Transmission on how to negotiate with landowners whose farms are on projected pipeline routes . . .

Importance of Accountants

Growing responsibilities in utility management stressed at conference

The vital role of accounting in checking the trend toward governmental controls, in promoting sound business relationships with government, and in creating the conditions necessary to efficient management and to good industrial and public relations, was sharply emphasized at the National Conference of Electric and Gas Utility Accountants, April 11-13 at the Book-Cadillac hotel, Detroit.

Sponsored jointly by the American Gas Assn. and the Edison Electric Institute, the conference attracted an all-time record registration of 722 persons, more than 100 above last year's record gathering.

Business sessions were augmented by an impressive exhibit of accounting machines and office equipment shown by all the major firms serving the field.

L. E. Reynolds, Connecticut Light and Power Co., Hartford, AGA accounting chairman, and A. G. Mitchell, Philadelphia Electric Co., EEI accounting chairman, presided at the conference and contributed much to its success by their able teamwork.

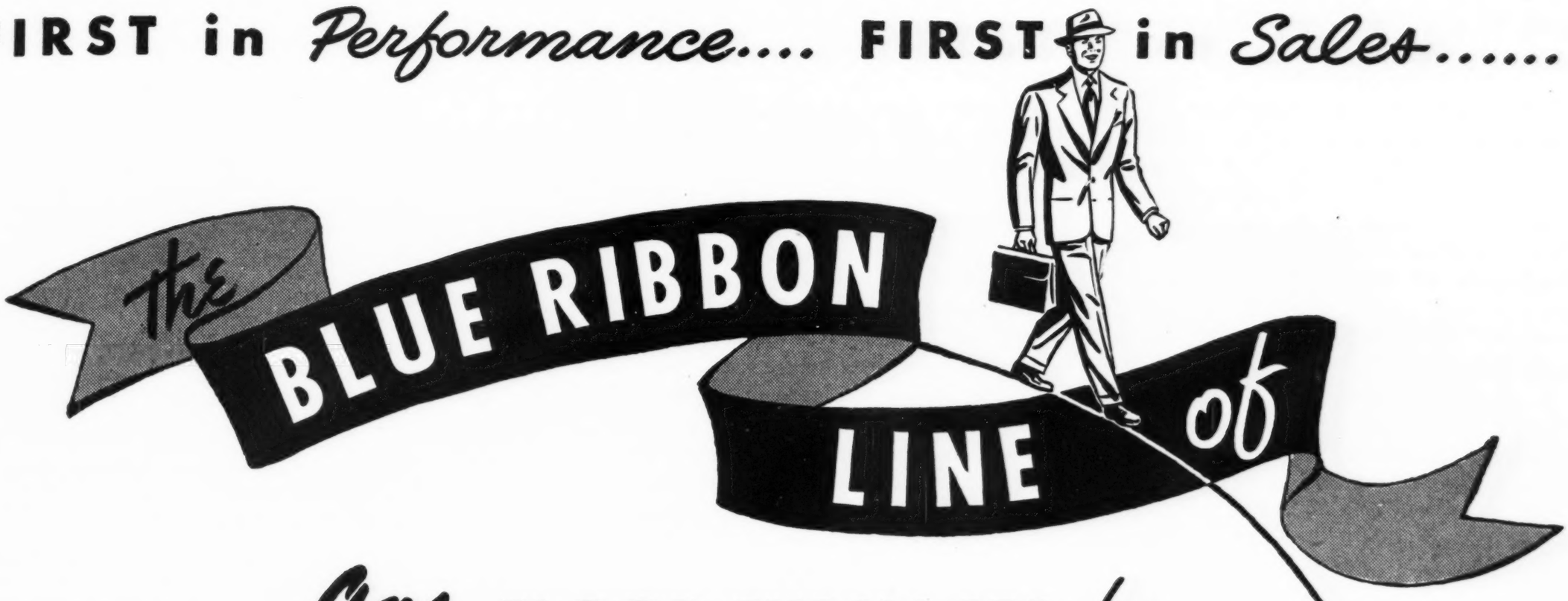
A forthright exposition of the position of accountants in a public utility was presented by D. A. Hulcy, president, Lone Star Gas Co., Dallas, and vice president, AGA, who declared that they will continue to grow in importance in the company executive branch. They must have imagination and enthusiasm as well as a knowledge of facts and people in order to prepare a long-range program, he said. In conclusion, Mr. Hulcy warned that the competitive free enterprise system is on the defensive and urged the accounting officers to tell the story of profits in their true light. "Earnings today may be high," he said, "but new money needed for construction is three times prewar figures."

Office working conditions and practices in accounting departments were dramatically highlighted with the aid of skits by J. F. Farley, New York State Electric and Gas Corp., Ithaca, chairman, accounting employee relations committee. Results of a survey of 42 companies were given by Mr. Farley, who pointed out that a sound employee relations policy is the result of painstaking and continuing research within and outside the company.

Short term and long term trends in the business outlook were analyzed in an informative address by Sumner H. Slichter, Harvard University. "Although further price in-

ACCOUNTANTS COMPARE NOTES. C. E. Shields, Michigan Consolidated Gas, Detroit; W. L. Cisler, Detroit Edison, and John W. Roper, AGA section vice chairman, Washington (D.C.) Gas Light Co., check program at joint AGA-EEI conference.

FIRST in *Performance*.... FIRST in *Sales*.....



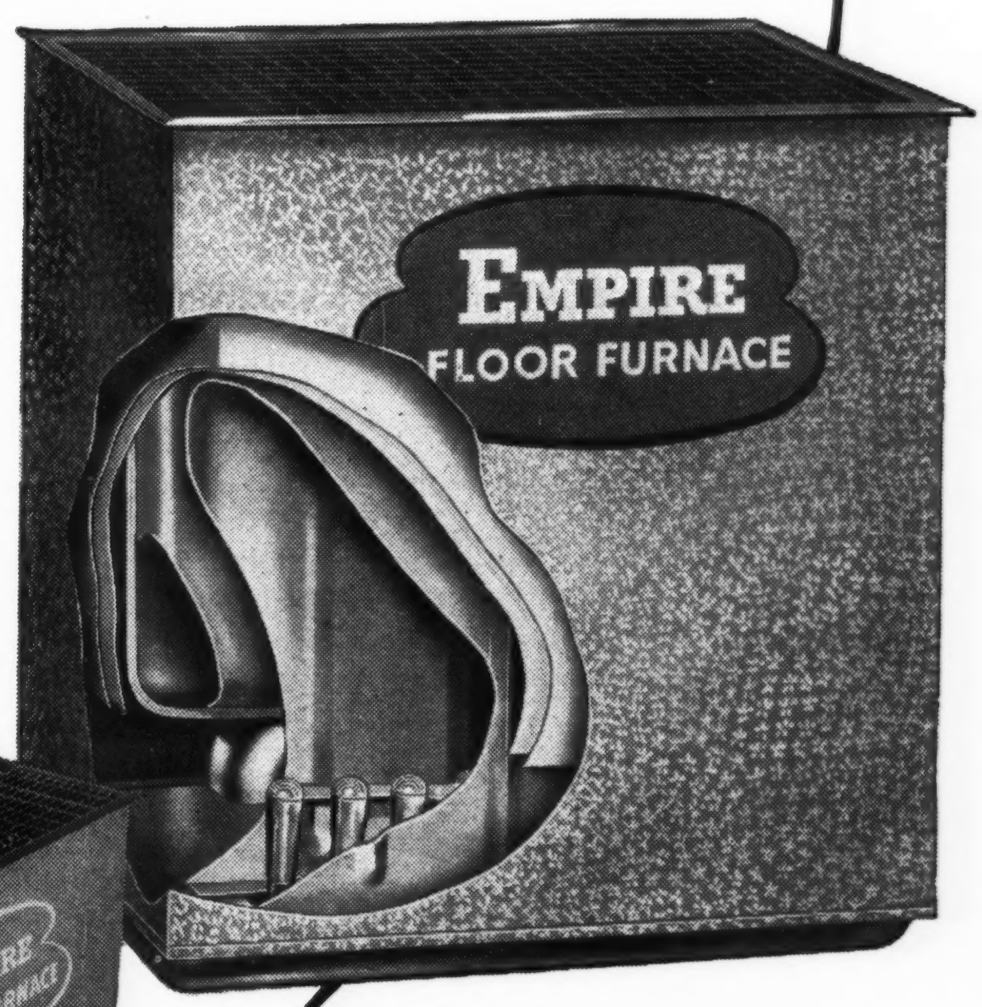
Gas FLOOR FURNACES *by*

EMPIRE

THE WORLD'S LARGEST MANUFACTURER OF *Gas* FLOOR FURNACES

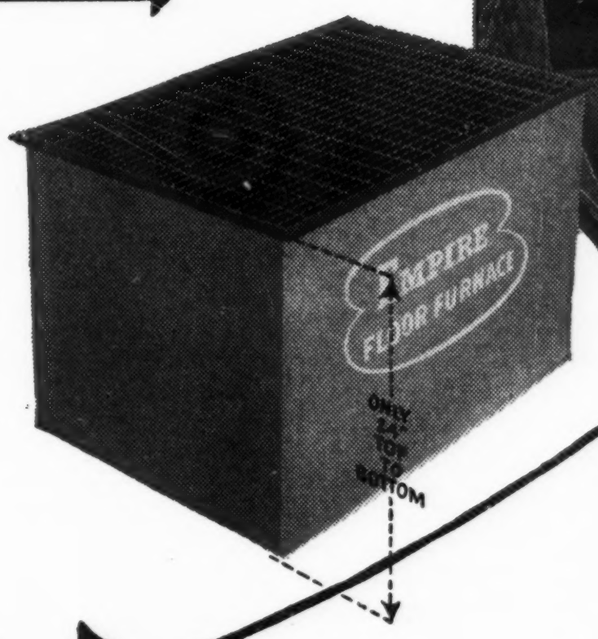
The EMPIRE DeLuxe

Widely adaptable—burns any type gas—unmatched in performance, economy, and trouble-free service. First in sales throughout America — north, east, south, west.



The EMPIRE "Lo-Boy"

Newest addition to the EMPIRE line meeting the demands for a low-cost, economical heating unit. Superbly engineered. Only 24 inches top to bottom.



THE LINE WITH THE FAMOUS

"Thriftmatic" Gas BURNER

See The EMPIRE Representative in Your Territory or Write Us Direct

EMPIRE STOVE CO., BELLEVILLE, ILLINOIS

MANUFACTURERS OF GAS HEATING AND COOKING APPLIANCES

creases in some industries are necessary," Prof. Slichter asserted, "the immediate business situation calls for improvements in quality and cuts in prices." For the long term, he predicted slow price rises, higher hourly earnings, more output per hour, and a growing share of the national product for employees.

Headline speakers at the general luncheon which closed the conference were AGA President Robert W. Hendee, president, Colorado Interstate Gas Co., and Justin R. Whiting, president, The Commonwealth and Southern Corp., New York.

A penetrating discussion of financial and rate-making problems was given by Mr. Whiting, who declared that "financing is the urgent problem of the hour." While the 10 million investors in this country today profess a belief in our capitalistic system, "the markets indicate that they are not willing to bet large amounts of money on it," he said. "The whole trend of the socialization of industry causes a fear which must be overcome in the sale of securities." He called attention to the shifting of wealth in the United States and urged greater effort to interest employees and small investors in corporation securities.

Hatley Heads Hoosiers

The Indiana Gas Assn., at its 39th annual convention held at French Lick, April 28-29, elected A. E. Hatley, sales manager for Central Indiana Gas Co., Muncie, as president. Mr. Hatley succeeds L. B. Schiesz, president of Indiana Gas & Water Co., Indianapolis.

Other officers elected by the association were: vice president, C. K. Graham, vice president of Southern Indiana Gas & Electric Co., Evansville; secretary-treasurer, Clarence W. Goris of Northern Indiana Public Service Co., Gary. New directors are Fred W. Dopke, Indiana Gas & Water Co. Inc.; E. M. Hahn, Kokomo Gas Co., and E. G. Peabody, Citizens Gas & Coke Utility, Indianapolis.

42 Speak at Sales Meet

Nearly 200 delegates from 27 states and Canada attended the three-day AGA Sales Conference on Industrial and Commercial Gas, held April 5-7 in the Andrew Jackson hotel, Nashvilie, Tenn. The sessions were divided into Commercial Gas Day and Industrial Gas Day and a general session. All the sessions were packed with talks on pertinent gas industry topics by no less than 42 speakers. Never before had so many different subjects been treated at one conference.

CNGA June Frolic

Plans for the 1949 all-day June Frolic of the California Natural Gasoline Assn., scheduled for June 4 at the Rio Hondo Golf Club, Downey, have been completed.

The daytime events, with the first flight of golfers teeing off as early as 7 a.m., have been rounded out into a mammoth sports fiesta, with golf, baseball, horseshoes, marksmanship and small games included. The evening program is given over to the enjoyment of an excellent barbecued dinner, which will be climaxed with a show.

Big Doings in Florida

The 14th annual convention of the Florida-Georgia Gas Meters Assn. was held in St. Augustine, Fla., April 10-12 at the Ponce de Leon hotel. Buell Duncan was convention chairman for the three-day gathering.

Preceding the annual get-together, the election of new officers took place, with James K. Roberts of the Florida Public Utilities Co., West Palm Beach, elected president. Roberts and his fellow office-holders were installed at the annual banquet on the last evening of the convention.

Retiring president Cliff Noda became the new vice president, as is the association's custom, and Jack W. Owen was re-elected as secretary-treasurer.

Canadians Off to Bigwin

The 42nd annual convention of the Canadian Gas Assn. is promising to be an exceptionally well-attended affair. Latest news letter from the CGA states that more than 60% of the attendance registration objective has been obtained, with the convention still a number of weeks away.

This year's CGA meet will be held June 16-20 at Bigwin Inn, Lake of Bays, Muskoka, Ontario.

DOMESTIC RESEARCH AND UTILIZATION CONFERENCE. At the AGA meeting in Cleveland April 1 (reported in GAS, May, p. 51), Dr. William R. Hainsworth, Servel; K. H. Flint, Borg-Warner; William R. Teller, Bryant Heater, and Eugene D. Milener, coordinator of utilization research, AGA, meet in hotel lobby.

Calendar

June

New England Gas Assn. Operating Division—Hotel Kimball, Springfield, Mass., June 2.

Midwest Industrial Gas Council—Moraine hotel, Highland Park, Ill., June 2-3.

Fourth International Gas Conference—London, England, June 15-17.

Canadian Gas Assn. Annual Convention—Bigwin Inn, Lake of Bays, Ontario, June 16-20.

New York-New Jersey Regional Gas Sales Conference—Essex & Sussex hotel, Spring Lake, N. J., June 20-21.

Michigan Gas Assn. Annual Convention—Grand hotel, Mackinac Island, Mich., June 24-25.

August

National Assn. of Railroad & Utilities Commissioners—Hotel Cleveland, Cleveland, Ohio, Aug. 7.

September

Mid-West Gas Assn. School & Conference—Iowa State College, Ames, Sept. 6-8.

Pacific Coast Gas Assn. Annual Convention—Santa Barbara, Calif., Sept. 7-9.

New Jersey Gas Assn.—Monmouth hotel, Spring Lake, N. J., Sept. 9.

The Maryland Utilities Assn. Fall Conference—Cavalier hotel, Virginia Beach, Va., Sept. 16-17.

National Butane-Propane Assn.—Jefferson hotel, St. Louis, Sept. 19-21.

October

National Assn. of Corrosion Engineers, South Central Region—Adolphus hotel, Dallas, Oct. 3-4.

American Standards Assn. Annual Meeting—Waldorf Astoria hotel, New York, Oct. 11-14.

Texas Mid-Continent Oil & Gas Assn. Annual Meeting—Rice hotel, Houston, Oct. 13-14.

American Gas Assn. Annual Convention—Chicago, Oct. 17-20.

National Safety Congress—Morrison hotel, Chicago, Oct. 24-28.

National Metal Trades Assn.—Palmer House, Chicago, Oct. 26-28.

Independent Natural Gas Assn. of America Annual Meeting—Baker hotel, Dallas, Oct. 31.

November

American Society of Mechanical Engineers Annual Meeting—New York, N. Y., Nov. 27-Dec. 2.

REGULATION

Restrictions

Eased in Kansas but tight in Salt Lake City

The Kansas Corporation commission opened hearings on the question of modifying its statewide ban against the conversion of heating equipment to natural gas, at Topeka on June 6, Jeff A. Robertson, chairman of the commission has announced.

Approximately a year ago, because of a serious fuel shortage, the commission issued an order that residences and other fuel users could not convert their coal- or fuel-burning equipment to natural gas until additional supplies were available.

Alteration or modification of the order is being actively opposed by the Gas Service Co. of Kansas City, on the grounds that the present pipeline facilities are not sufficient to merit the lifting of the ban. Several heating contractors and companies, however, are urging that the present ban on conversion be abolished.

* * *

Gas hasn't got it—at least it won't "have it" in Salt Lake City very much longer. The Utah Public Service Commission has ordered a ban on the sale of all gas appliances—cooking, heating, water heating, and refrigeration—to become effective July 1.

The order restricting sale of appliances was made at the request of the Mountain Fuel Supply Co., supplying gas to the city, whose officials can't see enough gas in their future to supply the huge number of new customers that would normally develop. The population influx to Salt Lake City since war's end has been staggering; at the same time, supplies of gas have not increased in proportion. Dealers in Salt Lake, representing Servel and other large appliance manufacturers, waged a stiff fight against the measure to end gas appliance sales, but were unsuccessful.

There was a three-month period of grace allowed to dealers—ending July 1—so that they could dispose of stock on hand. Since the edict was first made public, Salt Lake City dealers have been engaged in a huge selling program to get their gas appliances sold and installed in homes before the deadline date.

ConEd Rate Protest

Vigorous protest against increased interim gas rates instituted in January was lodged before the New York Public Service Commission recently. Several customers of Consolidated Edison appeared before a commission examiner and charged that rates for residential heating and cooking were up as much as 55% as a result of the granted increase, which will total almost $11.5 million per year.

An engineer for the company testified before the examiner that residential heating and cooking rates would average about 45% over last year, commercial users of gas for heating only would pay about 51% more, and the other commercial users would pay a 13% increase. The overall dollar increase in each category will total about $2 million, adding up to the $11.5 million grand total increase.

Customer-spokesmen for the civic and private groups protesting the increase decried the "huge amounts spent in advertising—by a company whose customers couldn't switch to another supplier if they wanted to," and averred that "the company is hurting itself . . . the customers can't carry this latest increase." One home owner said he would have to raise the rent of his tenants because of the increase in his gas bill from $28 to $45 per month.

Connection Ordered

An initial decision handed down by presiding FPC examiner E. B. Marsh directed Manufacturers Light & Heat Co. (Pittsburgh) to connect its facilities to those of Waynesboro (Pa.) Gas Co., in a hearing last month.

The decision, subject to review by the full FPC examining staff, found that the connection would not impair Manufacturers' service to its existing customers and that the connection was advisable in the public interest. The city of Waynesboro, Pa., would be serviced by the increased gas evolved. Manufacturers Light & Heat had submitted to the FPC earlier that such a connection would not impair its existing service.

At present, the Waynesboro lines reach to a point only 20 ft distant from those of Manufacturers. The presiding examiner directed the larger company to make the connection by June 1.

John Bull Takes Over

Britain's Labor government added the gas industry to its list of nationalized enterprises as expected early last month, thus adding the seventh major industrial group to be aligned under state administration.

In nationalizing the gas companies, the British government gained some 130,000 employees, who had formerly been workers for some 770 private companies and 275 municipally operated firms. Management of gas facilities in England will henceforth be undertaken by a central, national gas board and 12 area councils.

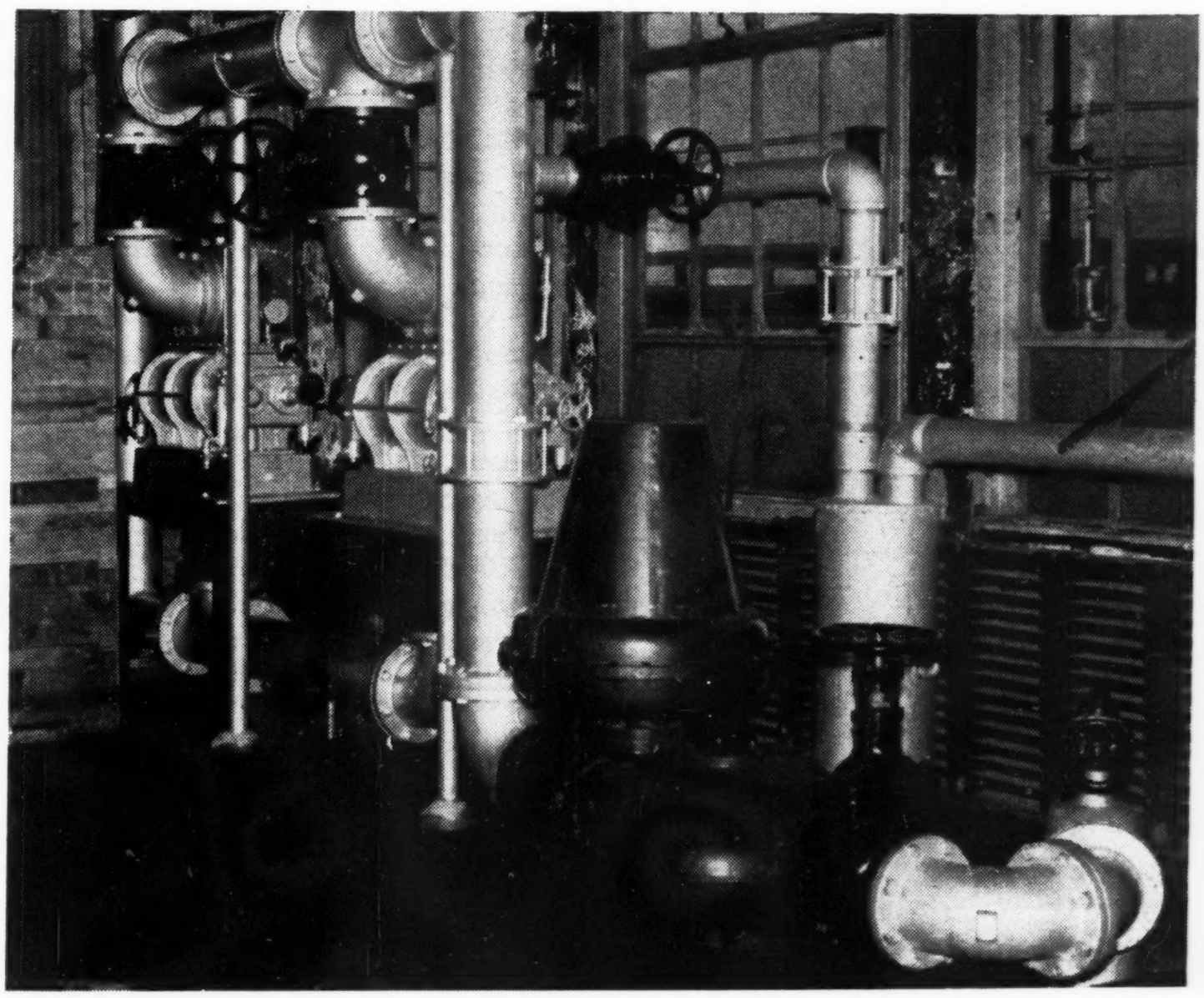
Owners of the nationalized companies will be compensated for the transfer of their organizations with government gas stocks bearing 3% interest. The companies have an estimated worth in excess of $1 billion.

Collectivisation of the gas industry had been expected in Britain for some time, since Labor party manifestos had long ago named it as a basic target for nationalization and Parliament had ordered it last year.

Oklahoma Export Tax

At month's end, the state of Oklahoma was still pondering an export tax on the natural gas sent to other sections of the country. The severance tax, reported favorably out of the revenue and taxation committee, will probably call for a 1-cent-per-Mcf levy, not applicable to Oklahoma industries.

One state senator, however, is in favor of upping the tax to 3 cents per Mcf. Oklahoma legislators hope that the tax, in its final form, will go a long way toward paying for the state's ambitious 1949 program of institutional building.



ONE OF THE LARGEST gas meters in Cincinnati, this installation includes two Connersville rotary type meters with a capacity of 66 Mcf/hr. It was put into the Lunkenheimer Valve Co. plant by Cincinnati Gas & Electric Co., which supplies Lunkenheimer via an 8-in. high pressure line, reduced at the meters by an Emco regulator. The plant's demand is approximately 54 Mcf/hr. Installation was made during inventory shutdown so service was not interrupted.

A SIMPLE SOLUTION for one of the GAS INDUSTRY'S *most trying problems*

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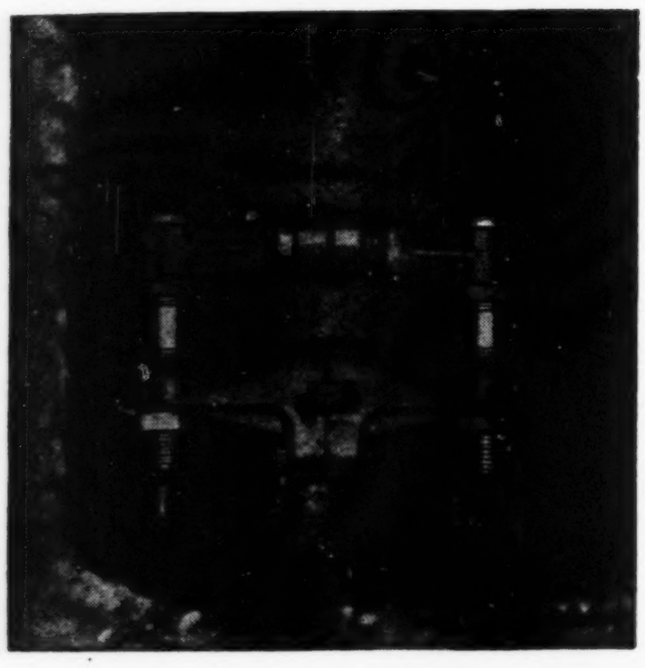
BELL JOINT CLAMP

SOLVES YOUR JOINT REPAIR PROBLEMS

6 inch Normac Clamp being lowered into hole for installation



6 inch Normac Clamp in service after installation

QUICK • EASY • PERMANENT

Installed in small pavement openings. Available in all standard sizes from 3" to 12". A simple set of tools cleans the joint, installs the clamp . . . often in only a quarter of an hour. SAVES TIME. SAVES MONEY and the repair is permanent. Designed for all conditions particularly where pavement repair costs are prohibitive. Such small opening repairs are scarcely noticeable when pavement is replaced.

Normac Clamps can be installed in large as well as small openings.

Norton - McMurray hold definite leadership in the development of methods for installation and rehabilitation work through small openings. We welcome the opportunity to help solve a problem you may have—tell us about it.

Write for our catalog describing our complete line of COUPLINGS . . . FITTINGS . . . SERVICE TEES and ELLS . . . SLEEVES . . . COMPRESSION-END COCKS . . . METER BARS and BRASS FITTINGS for copper pipe.

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FINANCIAL

Utility Income Up

The "mild recession" suffered by U. S. business in the early days of 1949 didn't even touch the nation's natural gas companies; those reporting to the Federal Power Commission for the month of January listed profits for that period at more than $103.6 million, a 15.4% increase over the same month in 1948.

Almost all phases of financial statements having to do with the month of January, showed similar increases on the FPC books. Gas utility operating income was set at about $23.6 million, up 15.6% from a year ago. Net income was up almost $3 million. Gas operating revenue deductions amounted to $80.1 million, up 15.4%.

Gas sales to ultimate customers were more than 1611 MMcf for the month, a jump of 14.5% over 1948. Of this increase, revenues from industrial consumers alone went up 27.4%.

The total listed by the FPC for gas revenues for the year ending Jan. 31 aggregated $893,159,583, a big 17.9% jump over the total for the 12 months ending Jan. 31, 1948

* * *

Operating revenues of natural gas companies reporting to the Federal Power Commission were $101,823,412 in February, an increase of 11.3% over the same month in 1948.

Gas utility operating income for the month was $77 million, up 5.8%. Net income was $24.7 million, some $600,000 over the corresponding period last year. Gas sales were up about 11%.

For the twelve months ending Feb. 28, gas operating revenues totaled $903,711,514, 16.8% above the $773,459,188 reported for the year 1947-48.

Rate Roundup

Nearly half a million dollars was slashed from the manufactured gas bill of Portland (Ore.) customers this spring. The Portland Gas & Coke Co. reduced prices by $445,000 annually, with lower prices starting April 15.

Coupled with an earlier reduction of $557,000, effective Feb. 10 of this year, the total reduction amounts to upward of $1 million since the start of 1949. Both end reductions resulted from intermediary drops—in the price of gas-making oil. Portland G&C rates are geared to a 5-cent-per-barrel variable in the price of the oil; when a 5-cent drop in oil is proclaimed, gas prices drop 1.2 cents per Mcf. Total reduction to customers this year has amounted to 10.8 cents per Mcf.

Rate schedules for the Michigan-Wisconsin gas pipeline, when completed, will hold steady, it was announced in recent testimony by T. W. Weigele, president of Michigan Consolidated Gas Co., before the Federal Power Commission.

Mr .Weigele told commissioners that his 1952-54 sales estimates have been completed, based on an assumption that there will be no change in rate schedules.

Elsewhere on the rate scene:

Central Hudson Gas & Electric Co., Pough-

demand DETROIT CERTIFIED CONTROLS

THE DETROIT LUBRICATOR COMPANY
DETROIT
Certifies as to the reliability of any device of its manufacture and bearing its nameplate or monogram. The company certifies and guarantees such device, under normal use, to give reliable and trouble-free service when properly installed. If such device is found defective, it will be replaced under our standard guarantee or published replacement plans.
For more than 70 years the name DETROIT Lubricator Company has stood for quality beyond question. The certification of every DETROIT Control is your assurance of the continuation of this policy of building your business and our business on the firm foundation of complete customer satisfaction.
"DETROIT"

Look for this Certificate — only Authorized DETROIT *Wholesalers sell certified Controls.*

Protecting YOUR Reputation—Maintaining OURS

DETROIT, famous for quality for over seventy years, now offers you the most aggressive and complete backing in its history. In addition to DETROIT'S great nation-wide distributing organizations and an exceptionally well qualified factory service group, every control in the DETROIT line is Certified. This means Controls you can sell with confidence because they are built to give your customers the maximum in convenience, reliability and economy—greater satisfaction for users, added profit for you. The next time you order heating controls, specify DETROIT. For, only with DETROIT do you get the important plus value of this Certified Quality—protecting your reputation, maintaining ours.

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Division of American Radiator & Standard Sanitary corporation
CANADIAN REPRESENTATIVES: RAILWAY & ENGINEERING SPECIALTIES, LTD. — MONTREAL, TORONTO, WINNIPEG

DETROIT HEATING AND REFRIGERATION CONTROLS • ENGINE SAFETY CONTROLS • FLOAT VALVES AND OIL BURNER EQUIPMENT • DETROIT EXPANSION VALVES AND REFRIGERATION ACCESSORIES • STATIONARY AND LOCOMOTIVE LUBRICATORS

Serving home and industry AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILER • ROSS HEATER • TONAWANDA IRON

keepsie, N. Y., was granted a 3% interim increase in its electric rates, to run until Oct. 31, by the New York State Public Service commission. The increase will add about $100,000 to Central Hudson's net profits for 1949, and is a stopgap measure while discussion of a higher permanent rate schedule for the company is under way.

Republic Light, Heat and Power Co. of Buffalo, N. Y., has been authorized by the state public service commission to boost its rates by about $200,000 annually. With restrictions that the company is to be held responsible for any out-of-line profits derived from the increase (which, when proved, must be repaid to customers), the commission authorized increased gas charges for consumers in Batavia, Dunkirk, and Ontario towns.

EXPANSION

Switch to Natural

Laclede Gas Light Co. started May 15 on the year-long job of switching some 300,000 St. Louis area gas burners from their present manufactured gas facilities to those usable with natural gas. The initiation of switch-over operations climaxes a plan dating back to war's end; originally scheduled to start early in 1947, it was delayed because of equipment and pipeline shortages.

Laclede president Robert W. Otto estimated the job will cost the gas company about $3 million, and will be completed in one year. Conversions & Surveys Inc. has been awarded contracts for the task, both in St. Louis proper and in the surrounding county area. A two-line pipeline from southern fields, completed this year, makes the conversion operation possible—it increased daily gas delivery to St. Louis to 266 MMcf.

Although some natural gas has been furnished by Laclede to industrial customers in St. Louis, none has heretofore been available to residential or commercial customers. Laclede purchases its gas from the Mississippi River Fuel Corp., the pipelines originating in Louisiana fields.

Koppers Buys Freyn

Freyn Engineering Co., for many years widely known as specialists in the design of heavy steel mill facilities, has been wholly purchased by Koppers Co. Inc., according to to announcement last month. The Open Hearth Combustion Co., a Freyn subsidiary, was included in the Koppers acquisition.

Brehon Somervell, Koppers president, said that the purchase was completed through the exchange of Koppers stock with that of Freyn, and that for the present, the engineering firm will be operated as a wholly owned subsidiary of the parent organization. No changes in policy or personnel are anticipated.

"To Koppers' engineering and construction division, which has been equipped to design and construct byproduct coke ovens, auxiliaries, and chemical plants," General Somervell said, "we are adding the 'know-how' of Freyn experts—we are now ready to supply both foreign and domestic companies with complete designing and engineering consultation for complete steel plants."

Continental Sold

The Continental Water Heater Co. of Los Angeles is now a totally owned subsidiary of the National Steel Construction Co. of Seattle, according to an announcement made recently by Wayne Smith, president of Continental.

Mr. Smith states that Continental will operate under the same management and will continue to produce the Continental line of gas water heaters.

In addition to the present production at plants located in Los Angeles and Seattle, water heaters will also be manufactured at a new plant located in Logansport, Ind.

Officers of the company will remain the same. These include: Wayne Smith Sr., president; Klaas Eisinga, vice president; Wayne Smith Jr., secretary; and Mrs. B. Shepherd, assistant secretary.

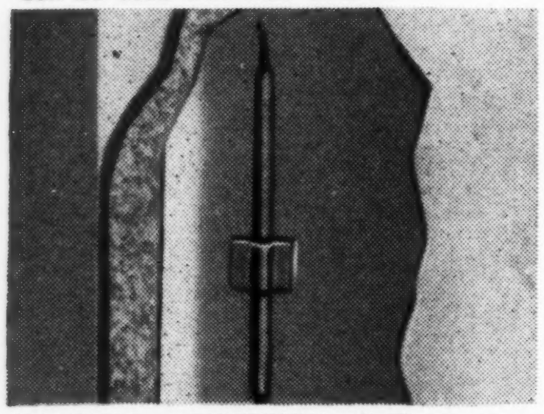
Trend to High-Btu Gas

Upwards of 30 gas utility companies have installed or are negotiating contracts to install flexible, low-cost, high-Btu oil processes to help meet peakload demands, according to announcements from AGA this month.

Biggest trend to the new processes is found among manufactured gas companies, the announcements said, but several mixed and natural gas companies are installing the systems as standby facilities for heavy demand periods, or as a means of accomplishing maximum production and distribution expansion at minimum cost.

Model 50 GASAPACK offers you MULTIPLE SAFETY...

Can be mounted directly to burner orifice, or in any position, regardless of location of thermostat bulb. Includes Automatic Safety Pilot, Thermostat, Gas Cock and Pilot Filter (where required). Can be used with ALL GASES.



"OUTSIDE MOUNTING" of Thermostat Bulb, eliminates need for thermostat tank spud. No chance of corrosion, water leakage. Easier and less expensive to install and service. No extra piping required.

- **LEAKPROOF SAFETY** — New Pilot and Thermostat Valve construction *prevents gas leakage* in the event of pilot failure.
- **SAFE LIGHTING** — No gas flows to main burner or pilot when pilot is out.
- **DOUBLE FAIL-SAFE PROTECTION**—Gas cannot flow if pilot is extinguished — or if any damage occurs to temperature thermostat.

You save assembly and production costs, too, with Model 50 GASAPACK. Only ONE unit to install.

PROTECTED PERFORMANCE — GAS CONTROLS

AUTOMATIC PRODUCTS COMPANY
2526 NORTH THIRTY-SECOND STREET
MILWAUKEE 10, WISCONSIN

DEPENDABLE

CONTROLS FOR HEATING . . .
AIR CONDITIONING . . . REFRIGERATION

VALVES FOR GAS "by DETROIT BRASS"

Assure MAXIMUM Efficiency and Economy

Valves determine, in large measure, the efficient operation of the appliance, the comfort resulting from use and the economy in operation.

- Your appliance demands a dependable valve—one that on past performance has proved itself a control to be relied on.
- Your appliance demands a trouble-free valve—one that doesn't talk back or call for attention but produces smoothly with endless satisfaction.
- Your appliance demands a valve made to high standards—to AGA specifications, as a guarantee of performance.

And when you use Detroit Brass valves you get all this and more!

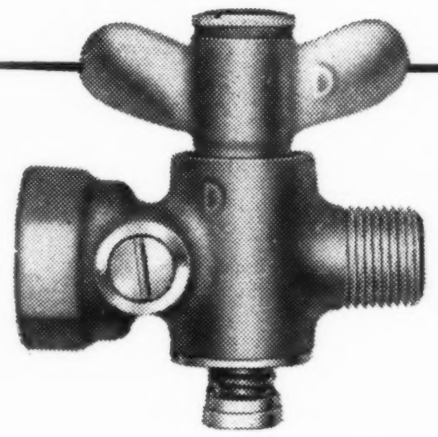
+ You get valves designed to perform for the life of your appliance.

+ You get valves engineered and produced out of more than fifty years experience in the development and manufacture of valves for gas.

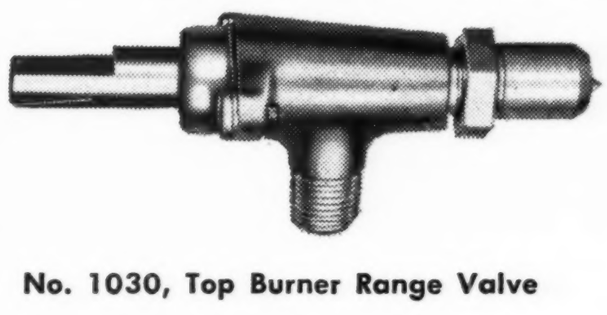
+ You get valves stamped with the nationally-known "D", a symbol of pride in workmanship.

These are some of the reasons why so many successful companies depend on Detroit Brass for valves. Why not join them in realizing these advantages by doing business with us?

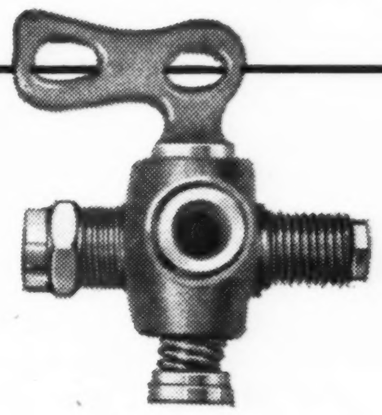
Gas Appliance Fittings produced by Detroit Brass & Malleable Works include a complete line of Valves for Gas Ranges, Water Heaters, Space Heaters, Gas-Fired Furnaces and Wall Heaters.



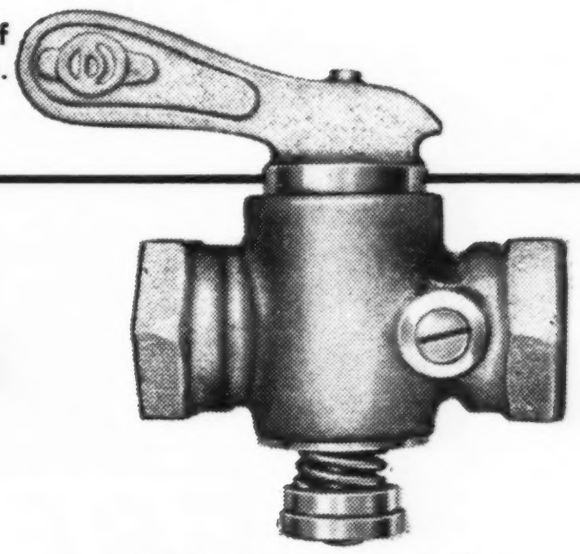
No. 1500, Water Heater Valve



No. 1030, Top Burner Range Valve



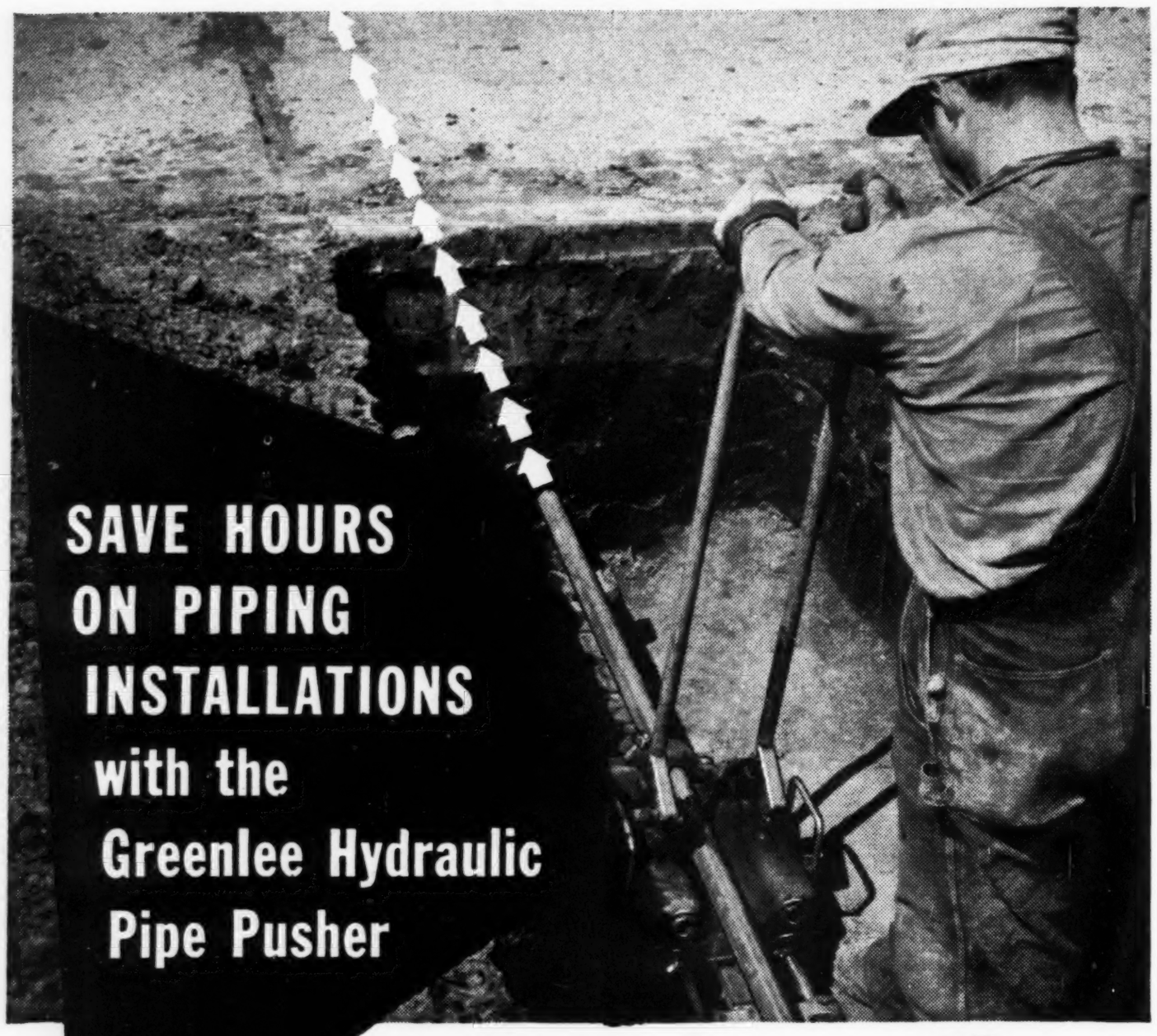
No. 1400, Space Heater Valve



No. 2000, Main Shut-off Valve

DETROIT BRASS & MALLEABLE WORKS

DETROIT 9, MICHIGAN

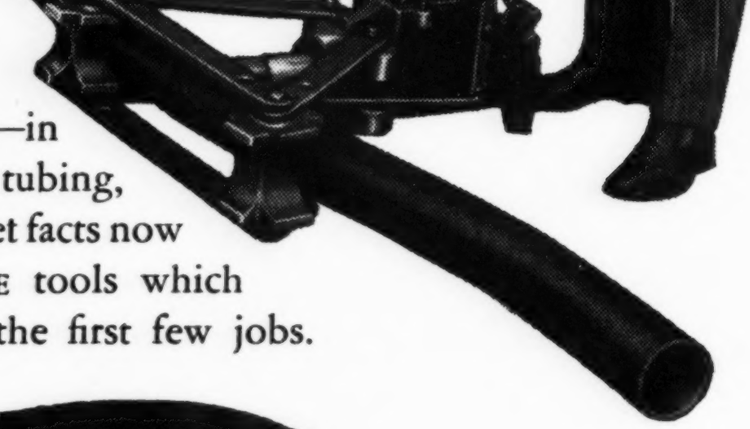


SAVE HOURS ON PIPING INSTALLATIONS with the Greenlee Hydraulic Pipe Pusher

...and a Greenlee Hydraulic Pipe and Conduit Bender

Yes, let a GREENLEE Hydraulic Pusher help speed and simplify your underground piping jobs. With it one man *pushes pipe* under streets, railways, walks, flooring and other obstacles. You eliminate extensive ditching . . . no tearing up of concrete, lawns, floors . . . no backfilling, tamping, tunneling, repaving. Two models: one for pipe up to 4″ and one for larger pipe, ducts, concrete sewer pipe.

You'll also save greatly on labor and material costs with a GREENLEE Hydraulic Bender on your jobs. One-man-operated. Makes smooth, *accurate* bends in just a few minutes—in pipe and conduit up to 4½″, tubing, bus-bars. Compact, portable. Get facts now on these *timesaving* GREENLEE tools which often pay for themselves on the first few jobs.



TOOLS FOR CRAFTSMEN

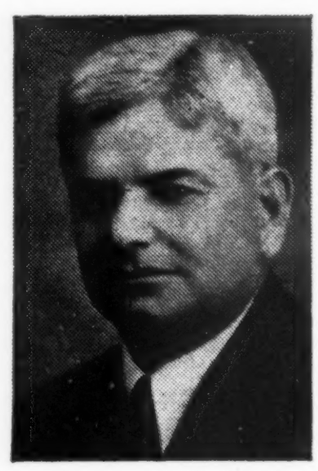
GREENLEE

WRITE GREENLEE TOOL COMPANY, 1946 COLUMBIA AVENUE, ROCKFORD, ILLINOIS for complete data on the above equipment as well as GREENLEE Spiral Screw Drivers • Auger Bits • Expansive Bits • Plumbers' Sets • Hand Benders and many other high quality tools.

PEOPLE

R. B. HURT, vice president of Hardwick Stove Co., Cleveland, Tenn., has announced the following appointments to the company's sales organization: RAY EHLERT will be associated with the division sales manager in the Chicago area; JOHN T. McGILLEN will headquarter in Boston and will work with the New England division sales manager; HOWARD A. SIMMONS will be associated with the manager in the Short Hills, N. J., area, covering New Jersey and eastern Pennsylvania; STREET RUSSELL will be a sales representative, primarily in Florida; REX LAMBERT is a new salesman in North and South Carolina and Tennessee; DAVE McKAY is representing Hardwick in western Pennsylvania, northern West Virginia, eastern Ohio, and western New York; and MEL ADAMS and CHARLIE WHITE have been added to the western territory where they will work with the Kansas City division sales manager.

L. M. KLAUBER was elected chairman of the board of San Diego Gas & Electric Co. last month at an organizational meeting following the annual meeting of stockholders. A. E. HOLLOWAY was named to succeed Mr. Klauber as president, and HANCE H. CLELAND, former board chairman, will continue as a director. H. G. DILLIN is now vice



L. M. Klauber

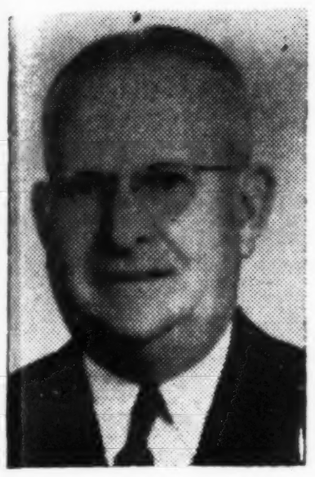
A. E. Holloway

president in charge of sales, the position formerly held by Mr. Holloway. Re-elected were all members of the board and E. D. SHERWIN, vice president in charge of operations; J. M. BOURUS, vice president and treasurer; ALLEN L. CHICKERING, vice president; and R. C. CAVELL, secretary.

ALLEN D. MacLEAN has been named chief engineer of the Chaplin-Fulton Manufacturing Co., Pittsburgh. For 20 years—until 1945—Mr. MacLean was associated with Pittsburgh Equitable Meter Co., advancing to the position of vice president and chief engineer. Recently he was in charge of the valve division of the H. K. Porter Co., also of Pittsburgh.

ALAN J. MacDONALD has been named assistant to DR. H. L. PURDY, new director of research and administrative controls for B. C. Electric Railway Co., Vancouver, B. C. Mr. MacDonald was formerly planning assistant in the firm's transportation and gas division.

GEORGE E. DEVENDORF was recently elected to the board of directors of Atlanta Gas Light Co. He succeeds the late Gabriel Caplan. All other directors were re-elected.



W. A. Wood

J. E. Glenn

W. A. WOOD, who has covered the states of Nebraska and South Dakota for the Pittsburgh (Pa.) Equitable Meter Division of Rockwell Manufacturing Co., has retired. JAMES E. GLENN succeeds him. Mr. Wood has been associated with the company since 1926, and Mr. Glenn since 1937, except for a period of military service.

R. E. JAMES recently was appointed western regional manager of appliance sales for Rheem Manufacturing Co., New York, and F. J. BLUME was named eastern regional manager. Mr. James, who joined Rheem in 1930, authored a "Primer on Water Heating" which is used as a training textbook in the water heating industry. He has designed water heating, space and central heating equipment for the company and for a number of years was associated with the Rheem research and development laboratories. Mr. Blume joined the company as eastern sales promotion manager in 1948. Previously he was associated with Eastern Industries Inc. and American-Standard.

VINCENT P. McDEVITT, general counsel for Philadelphia Electric Co. since 1947, recently was elected vice president in charge of legal matters. A. S. CORSON has been appointed comptroller of the company. Mr. Corson's entire business career has been with The United Gas Improvement Co. and affiliates, and he was a vice president of that company at the time of his recent appointment.

GEORGE S. YOUNG was elected a vice president of the Columbia Gas System Inc., New York, at a recent meeting of the directors. He joined the system as an engineer in 1930 and has been in charge of operations since 1946. Mr. Young was named vice president of Columbia Engineering Corp. in 1942 and a director in 1945.

BERTON M. SHARPE has been named sales engineer in southern Indiana, southwestern Ohio, and northern Kentucky for The Standard Furnace Division, Surface Combustion Corp., Toledo. Since joining the company in 1937, Mr. Sharpe has been engaged in engineering and service work in the industrial, aircraft, and space heating fields.

LAURANCE D. SIBLEY has been appointed general sales manager in charge of all district factory offices of Combustion Control Corp., Cambridge, Mass. Mr. Sibley, who was formerly chief engineer of the Bendix Aviation Corp., has been associated with Combustion Control since 1945.

"My operating cost was only .0206¢ per foot for cutting 130,487 feet of ditch."

Lee Teutsch, Owner, Ditch Digging Contract Service, says this about the

Longhorn Mobile Ditcher

Purchasing my first Longhorn Ditcher in February 1948, this machine dug 130,487 feet of ditch in the remaining ten months of the year. Varying from 20" to 36" in depth and from 8" to 12" in width the longest part of this work was on ditch 8" wide and 33" deep. A wide range of soils was encountered—hard clays, sticky clays, iron ore rocks, and sand, yet my total operating, repairs, and maintenance cost showed a cost per foot of only .0206¢, exclusive of operators' wages.

LONGHORN MOBILE DITCHER

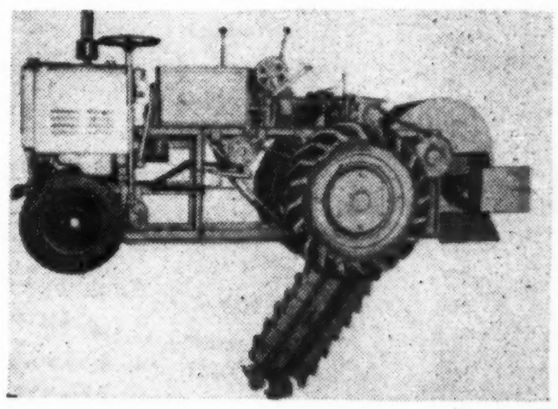
Has 90% of the features that distribution superintendents desire.

1—digs a 6" to 12" trench up to 42" deep, at a rate of 4 to 8 feet per minute; rated speed 1 to 25 feet per minute.

2—one-man operation.

3—travels on highways under its own power at 15 m.p.h.

4—43" tread squeezes into narrow places: can be spread to 63".



5—"hip" action allows operation of 30% lateral slope without undercutting.

6—weighs 5,000 lbs.

7—turning radius 12 feet.

WE WELCOME INQUIRIES. . *It will be a pleasure to send you complete information about the Longhorn Mobile Ditcher . . to answer your special questions. Let us hear from you.*

Longhorn Industries, Inc.

Henderson, Texas **Phone 1035**

HARRY W. TOWNSEND, vice president of Pacific Gas Corp., New York, has been elected president by the firm's directors. Mr. Townsend has been associated with the oil and gas industry since 1919 as a sales and marketing executive. As president of Pacific Gas, he will direct engineering, construction and marketing activities in the LP-Gas field.

CHESTER L. MAY, MARSHALL NEWCOMB, and H. J. CRAWFORD have been added to the board of directors of Lone Star Gas Co., Dallas. At the annual meeting, stockholders approved a proposal to enlarge the company's board of directors from 6 to 9 members; they re-elected the six former members and added those named above. Mr. May, vice president of distribution properties, and Mr. Newcomb, general counsel, are long-time Lone Star employees. Mr. Crawford, of Emlenton, Pa., is an oil and gas producer and banker.

M. V. OSTERHOUT, manager of the Milwaukee branch house of American Radiator & Standard Sanitary Corp., Pittsburgh, Pa., has been appointed supervisor of the new south central division headquartered in Cincinnati. FRANCIS P. McANENY, salesman in Milwaukee, succeeds Mr. Osterhout as branch manager. DARVIN O. ROUZER, a salesman at the Altoona, Pa., branch, has been promoted to manager of the new Parkersburg, W. Va., branch house.

J. A. B. LOVETT has resigned as president of Milwaukee Gas Light Co. and Milwaukee Solvay Coke Co., subsidiaries of American Light & Traction Co., because of ill health. GLENN R. CHAMBERLAIN has been elected to succeed him as president of Milwaukee Gas Light, and LOUIS G. KREUZ has been named vice president and general manager of Milwaukee Solvay Coke. Upon graduation from high school in 1897, Mr. Chamberlain joined the Grand Rapids Gas Light Co., now part of Michigan Consolidated Gas Co. He has held various positions in the gas utility industry ever since, becoming vice president and a director of American Light & Traction last February. At that time he was also elected executive vice president of the two Milwaukee firms. For almost 30 years Mr. Kreuz has been associated with Michigan Consolidated in Detroit. ROLAND PAULIN succeeds him as assistant manager of operations in the Detroit district, and PAUL E. EWERS replaces Mr. Paulin as commercial office manager.

JAMES DOYLE, market research analyst for Armour & Co., has been employed by Cribben & Sexton Co., Chicago, to work in the company's new department of marketing research. BERNARD KEWIN will assist Cribben & Sexton's John J. Brandt in sales promotion

Bernard Kewin

James Doyle

and public relations. Mr. Kewin has had 10 years of promotional experience with appliances in utilities, and recently has been employed by Servel.

FRED T. HOLLIDAY, vice president of W. J. Holliday & Co., Indianapolis, was elected a member of the Indiana Gas & Water Co.'s board of directors at the recent annual meeting of shareholders. He succeeds DAVID P. PARDEE, vice president, Public Service Co. of Indiana, also of Indianapolis. Other members of the board of directors and all the officers of the company were re-elected.

M. H. PARKINSON has been appointed comptroller of The United Gas Improvement Co., Philadelphia, and its subsidiary companies, it was announced recently. Mr. Parkinson has had 25 years experience in the public utility field, having served with Penn Central Light & Power Co. and with Pennsylvania Power & Light Co.

HUGH JAMES DENISON has been appointed assistant treasurer of Union Gas Co. of Canada Ltd. Mr. Denison, who will be stationed at the head office in Chatham, has been supervisor of general accounting for the Steel Co. of Canada Ltd. at Hamilton since 1939.

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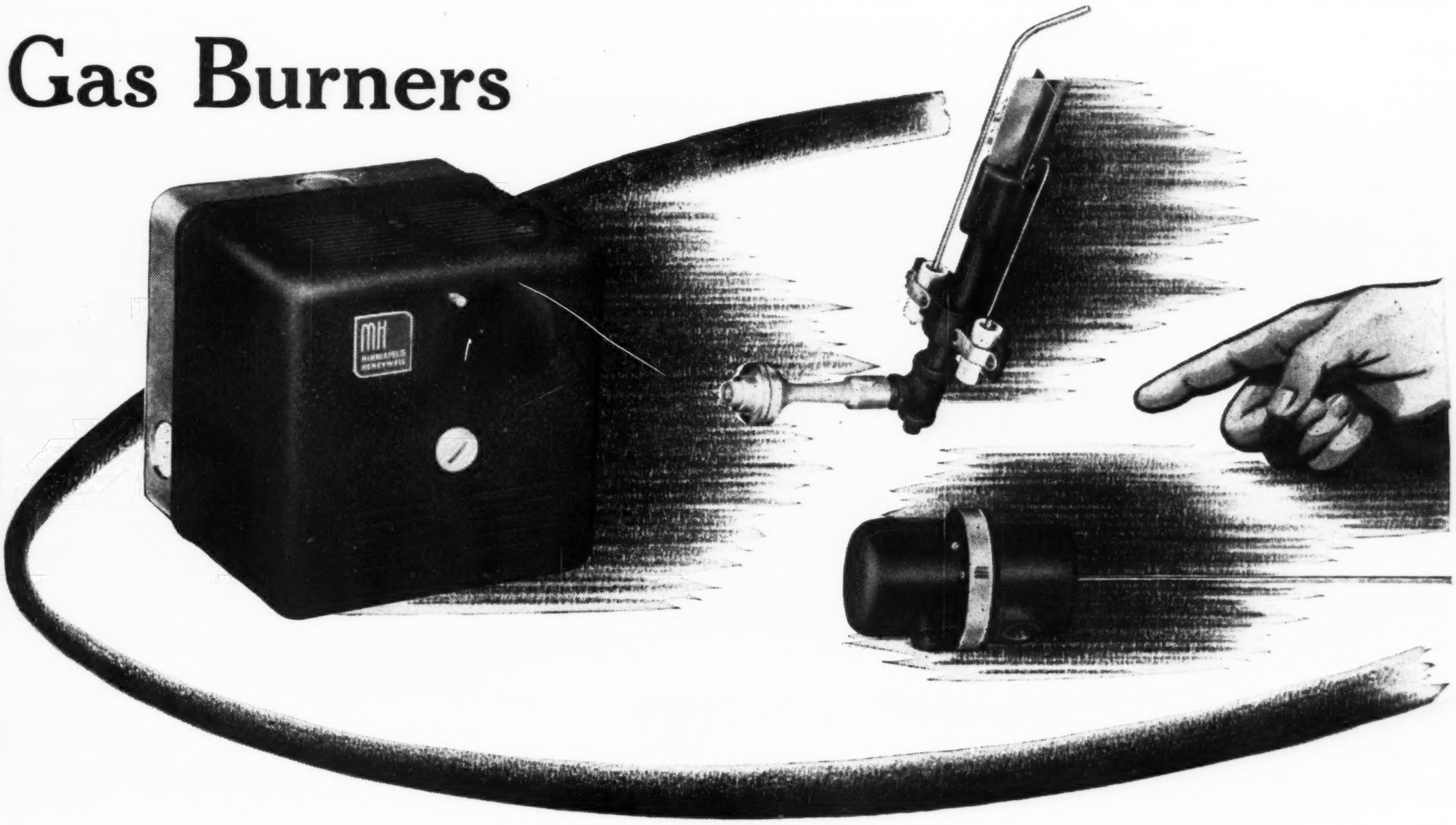

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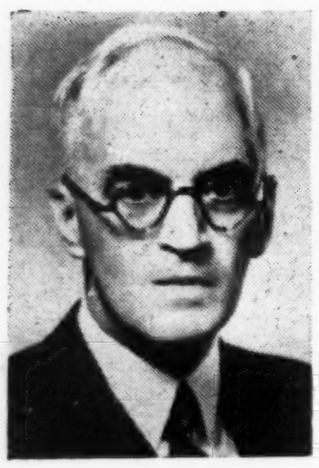


J. C. Parker

. . . ConEd

R. J. Seltzer

. . . Bryant

E. A. Brown

. . . Union Gas

Dana Paige

J. E. Wooddall

. . . Sprague Meter Co.

E. M. Lockwood

JOHN C. PARKER has retired from his post as a vice president of Consolidated Edison Co. of New York Inc. Mr. Parker joined the former Brooklyn Edison Co., a ConEd subsidiary, in 1922 as electrical engineer and later became vice president in charge of all Brooklyn Edison engineering. From 1932 until that company was merged into ConEd in 1936, he served as president. Elected a vice president of the parent company in 1936, Mr. Parker was responsible for the research and development departments. Recently he has been engaged in consultative duties and special assignments.

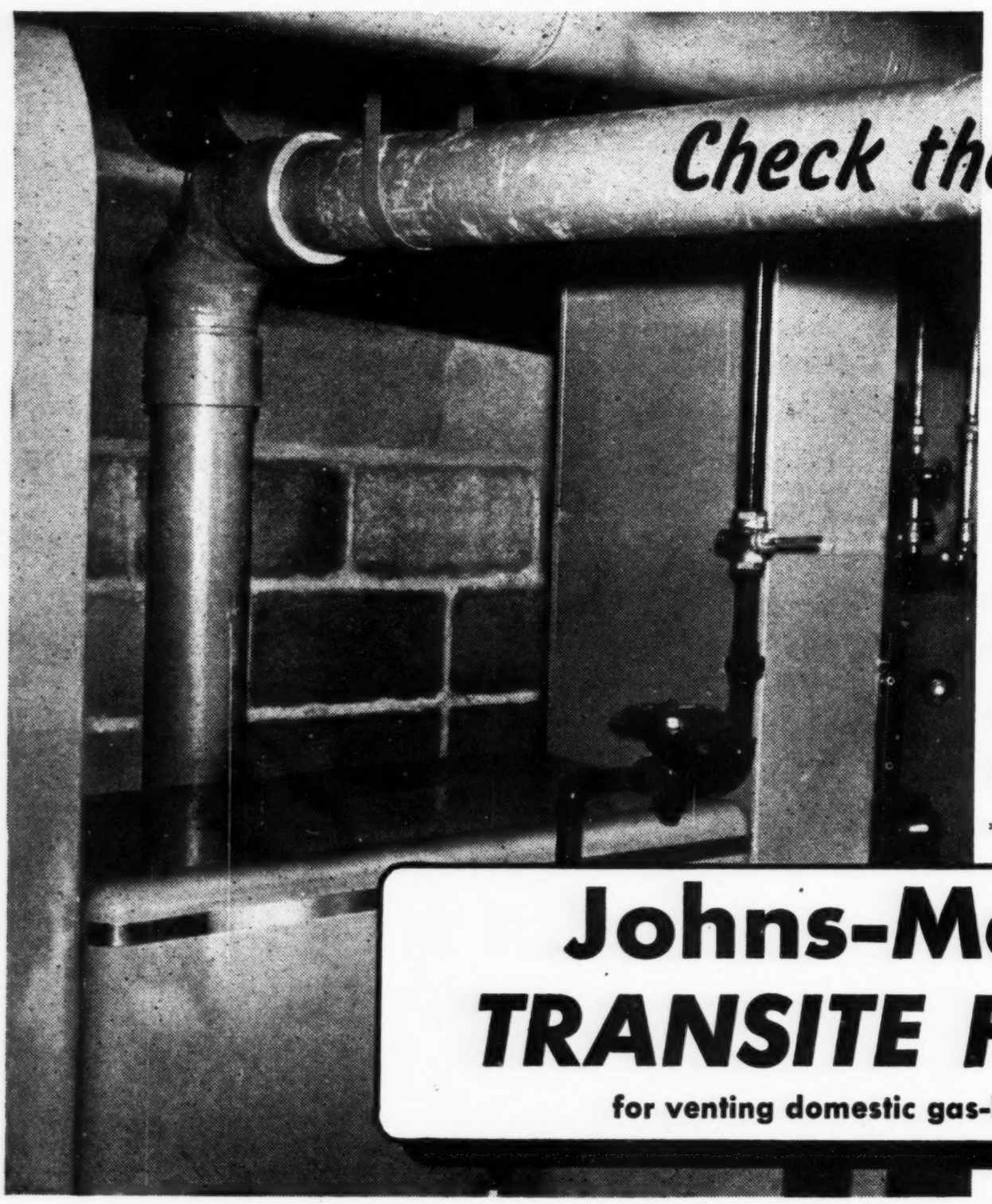
RICHARD J. SELTZER has been appointed production manager for all plants of the Bryant Heater Division, Affiliated Gas Equipment Inc., Cleveland, Ohio. Mr. Seltzer has been associated with Bryant since May 1948, serving in an advisory capacity at the Tyler, Texas, plant. Previously Mr. Seltzer was associated with Rheem Manufacturing Co.

E. A. BROWN has been named new business manager of Union Gas System Inc., Independence, Kan., serving properties in eastern and southeastern Kansas. Since 1934 Mr. Brown has been a salesman for the Union Gas companies, and for the past four years he has served as business manager of the Coffeyville district.

G. ROBERT HOWARD and WILLIAM A. BARRETT JR. have been appointed to Ebasco Services' New York staff of office management consultants. Both were previously associated with Standard Brands Inc. where Mr. Howard was staff advi er to the comptroller and Mr. Barrett was senior staff assistant in the sales division.

E. M. LOCKWOOD, Sprague Meter Co. (Bridgeport, Conn.) representative in the Midwest, recently was promoted to field supervisor of sales. JAMES WOODDALL has been transferred to the Los Angeles branch as assistant to the western manager and will cover parts of the Pacific coast and Rocky mountain states. He formerly represented the company in the South. DANA PAIGE succeeds Mr. Wooddall in the southern territory.

L. W. CHILDRESS was re-elected chairman of The Laclede Gas Light Co.'s board of directors at the annual meeting of the board held recently in St. Louis. ROBERT W. OTTO, president, and all other officers were also re-elected. About 73.6% of the shares were represented at the annual meeting of stockholders, and all directors of the company were re-elected at the meeting.



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for venting domestic gas-burning appliances

JOHN W. LIEBEGOTT, assistant secretary and assistant treasurer of The Manufacturers Light & Heat Co., Pittsburgh, retired on May 1 after more than 46 years of accounting and auditing work for the firm. Mr. Liebegott joined Tri-State Gas Co., a subsidiary of Manufacturers, in 1903.

Another personnel change has been announced by the Pittsburgh Group of the Columbia Gas System. L. E. SWINNEY has retired and J. N. BETZ has been appointed to replace him as district sales supervisor of The Keystone Gas Co. Inc., Binghamton, N. Y. Mr. Betz joined the company in 1946 and has been in charge of industrial gas sales in the Olean territory since that time. In his new position he will also supervise the sale of modern gas equipment in the Olean, Bradford and Warren areas.

FRANCIS EDGAR RICE, vice president, Phillips Petroleum Co., Bartlesville, Okla., received the Hanlon award, highest honor in the natural gasoline industry, on April 21 during the annual convention of the Natural Gasoline Assn. of America at Fort Worth, Texas. Mr. Rice became vice president of Phillips in 1930 and at that time was placed in charge of all natural gas and gasoline operations. The citation mentioned that he pioneered in use and development of the oil absorption process, superfractionation, butadiene manufacture, and research concerning properties of natural and LP-Gases.

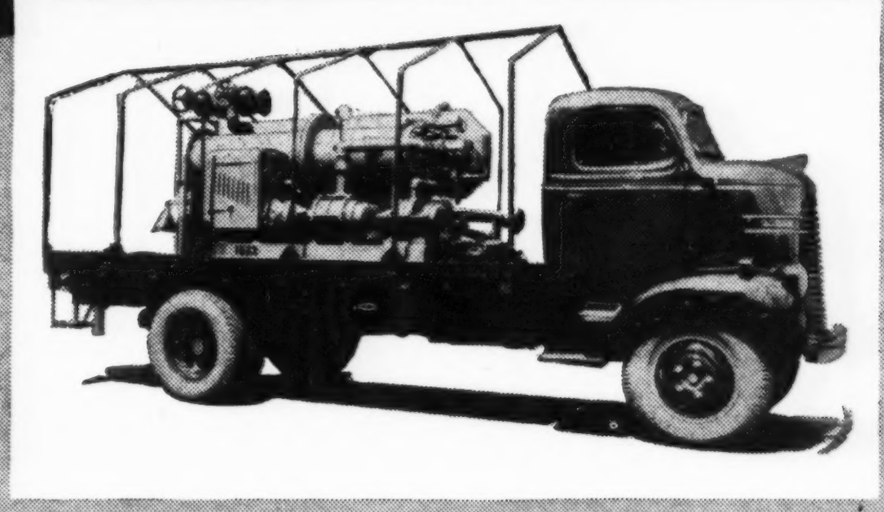
WILLIAM SCHMIDT JR. was re-elected chairman of the board and president of the Consolidated Gas Electric Light & Power Co. of Baltimore at a recent directors meeting. The company also announced re-election of the entire board of directors and of CHARLES P. CRANE, executive vice president; HENRY R. COOK JR., HERMAN L. GRUEHN, RALPH L. THOMAS and J. THEODORE WOLFE, vice presidents; AUSTIN E. PENN, secretary; and FRANCIS E. RUGEMER, treasurer.

E. C. STEELE, general superintendent, Union Gas Co. of Canada Ltd., Chatham, Ont., has retired. He was with the company in various capacities since 1918, and his gas utility career covers 48 years. Mr. Steele has always taken an active interest in Canadian gas affairs.

J. E. WALSH (seated at desk) has been appointed manager of the promotion, sales, and industrial engineering department for The Metropolitan Utilities District, Omaha. Shown with him are CHARLES M. GARVEY and JOHN N. GALLUP, salesmen. Mr. Walsh, who is well known in the gas industry, was elected vice chairman of the AGA Midwest Regional Gas Sales Conference for 1949-50 at the annual meeting held March 29-31 at the Edgewater Beach hotel in Chicago.

FOR PORTABLE OR STATIONARY PROTECTION...

R-C Inert Gas Generators



Portable R-C Inert Gas Generator, of 15,000 CFH capacity, mounted on pneumatic-tired truck.

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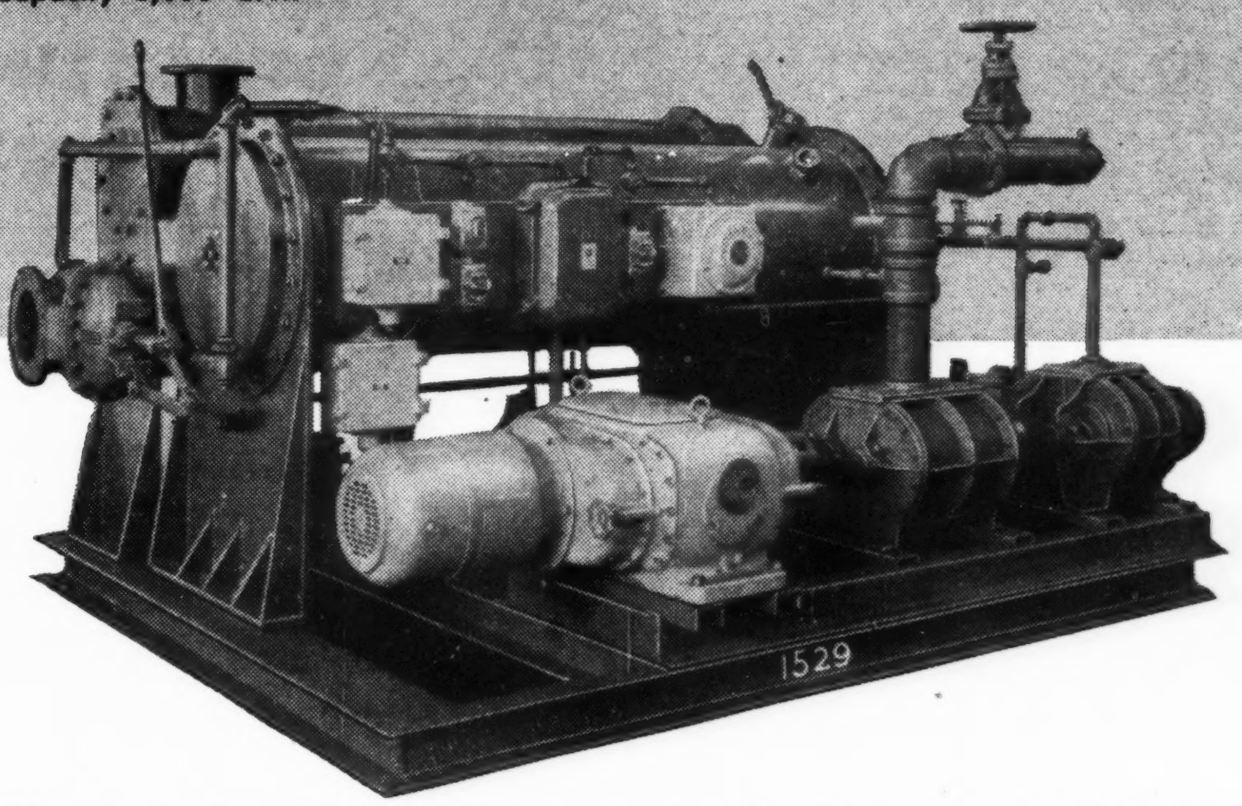
Stationary R-C Inert Gas Generator mounted on steel base. Capacity 3,000 CFH.



You can reduce the hazards of processing, handling or storing inflammable gases or liquids with R-C Inert Gas Generators. They produce cheaply a mixture of nitrogen and carbon dioxide, using oil or gas as fuel. Both fixed and portable units have these outstanding advantages:

1. Large capacity in terms of weight and cost.
2. Low operating and maintenance cost.
3. Quick adjustments for complete combustion.
4. No adjustments, for same fuel, needed after shut-down.
5. Operation not affected by variation in back pressure.
6. Extremely quiet operation.

With capacities from 1,000 CFH to 50,000 CFH, R-C Inert Gas Generators provide quick, dependable protection, at low cost. They are equally efficient, also, for inert gas production for processing operations. Write for details in Bulletin 100-B-14.

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BLOWER BUILDERS • R-C • SINCE 1854

BLOWERS • EXHAUSTERS • BOOSTERS • LIQUID AND VACUUM PUMPS • METERS • INERT GAS GENERATORS

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JOHN L. CONOVER has retired from The Public Service Electric & Gas Co., Newark, N. J. Mr. Conover has been with the company for 41 years and has been general commercial manager since 1940.

EUGENE A. WEAVER has left Surface Combustion Corp., Toledo, Ohio, to establish his own business as manufacturers' agent on Janitrol equipment for the state of Michigan. Concurrent with this announcement, the company stated that general sales management of the Janitrol divisions — aircraft-automotive heating division and domestic-commercial heating division — would be combined under one head with sales managers for each division. ROBIN A. BELL is general sales manager of both divisions; HARRY C. GURNEY is sales manager of the domestic-commercial division and JAMES W. ASHBY of the aircraft-automotive division; and RUSSELL W. GLENN is sales administration manager of the combined divisions. All these men were advanced from other positions in the organization.

JOHN K. SWANSON of Vermillion, Alberta, has been appointed supervisor of natural gas development in the province of Saskatchewan, J. H. Brockelbank, resources minister, announced recently. Mr. Swanson, who will be in charge of natural gas regulation and development, was associated with Consumers Power Co., Jackson, Mich., for 16 years and later became vice president and general manager of Minneapolis Gas Light Co. He went to Canada in 1938 as vice president of Northern Natural Gas and Franco Public Service Ltd., Saskatoon.

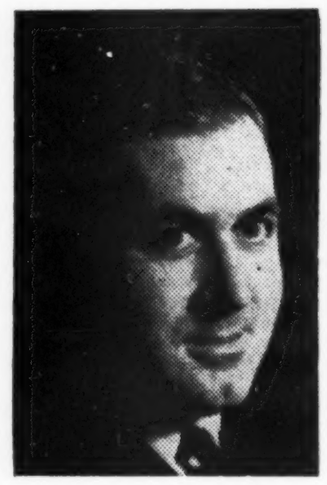
HENRY TUTTLE has been elected executive vice president of Michigan Consolidated Gas Co. by the board of directors. Mr. Tuttle has been vice president of the company since August 1945, having joined the firm in 1920 as serviceman in the shops department. WILLIAM A. RHAESA, assistant treasurer for the past four years, succeeds Mr. Tuttle as treasurer. Mr. Rhaesa entered Michigan Consolidated's accounting department as a typist in 1927 and advanced to supervisor of statistics and then chief accountant.

Henry Tuttle

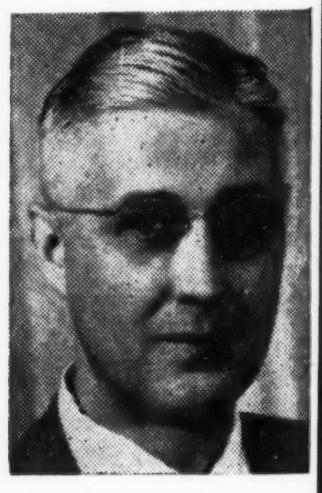
W. A. Rhaesa

C. L. LINDHOLM of Valparaiso, Ind., has been named assistant superintendent of the Harbor Works roll department of The Youngstown (Ohio) Sheet & Tube Co. Mr. Lindholm formerly worked for Carnegie-Illinois Steel Corp. in a number of capacities.

Presentation of the 1949 Willis Rodney Whitney Award to Dr. R. B. Mears, manager of the research laboratory of Carnegie-Illinois Steel Corp., Pittsburgh, and the 1949 Frank Newman Speller Award to F. L. La Que, in charge of the corrosion engineering section, International Nickel Co., Inc., New York, was made at the annual banquet of the National Assn. of Corrosion Engineers at the Netherland Plaza Hotel, Cincinnati, in April. Mr.



F. L. LaQue



R. B. Mears

Mears is the incoming president and Mr. La Que is past president of the association.

The awards, named after Willis Rodney Whitney, who was first to receive the award in recognition of achievement in the field of corrosion science, and after Frank Newman Speller, first to receive the award in recognition of achievement in the field of engineering, are made annually to the persons voted best qualified in the two fields defined.

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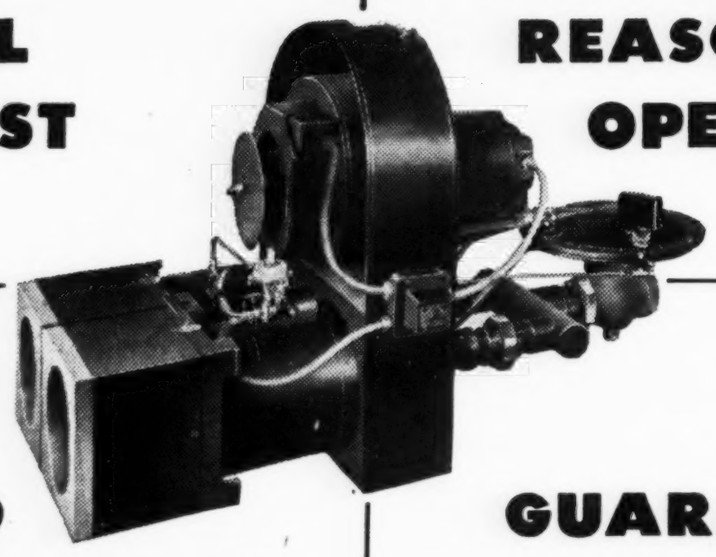

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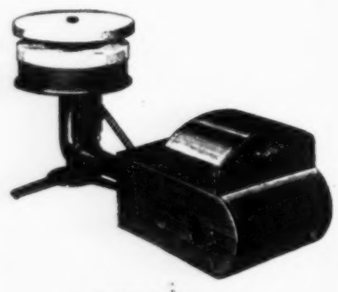

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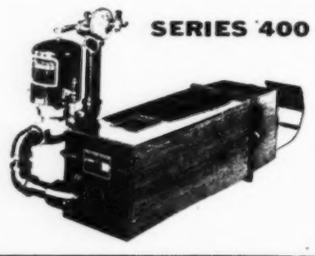

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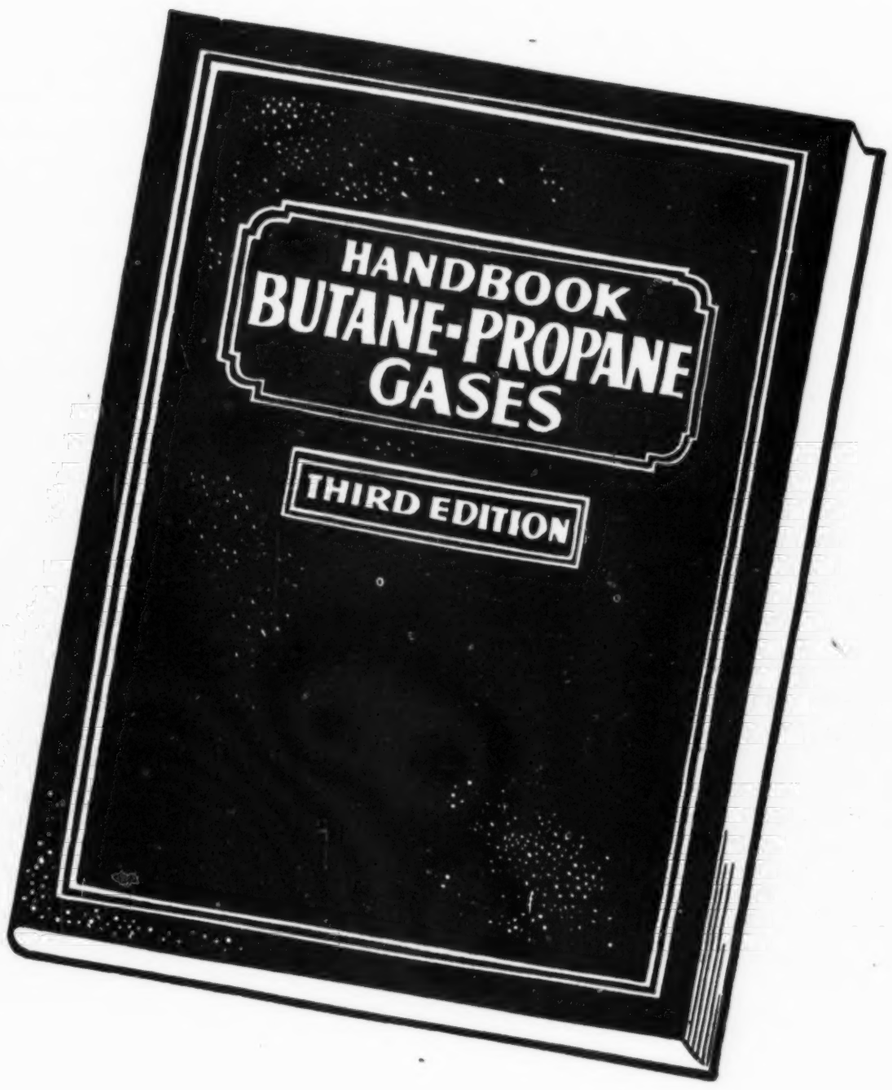

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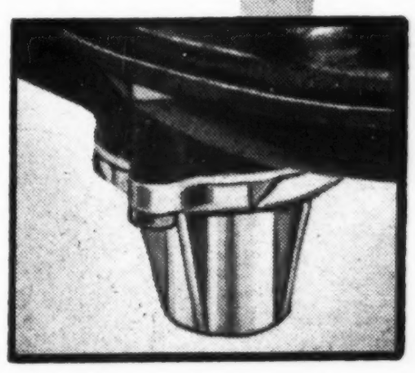

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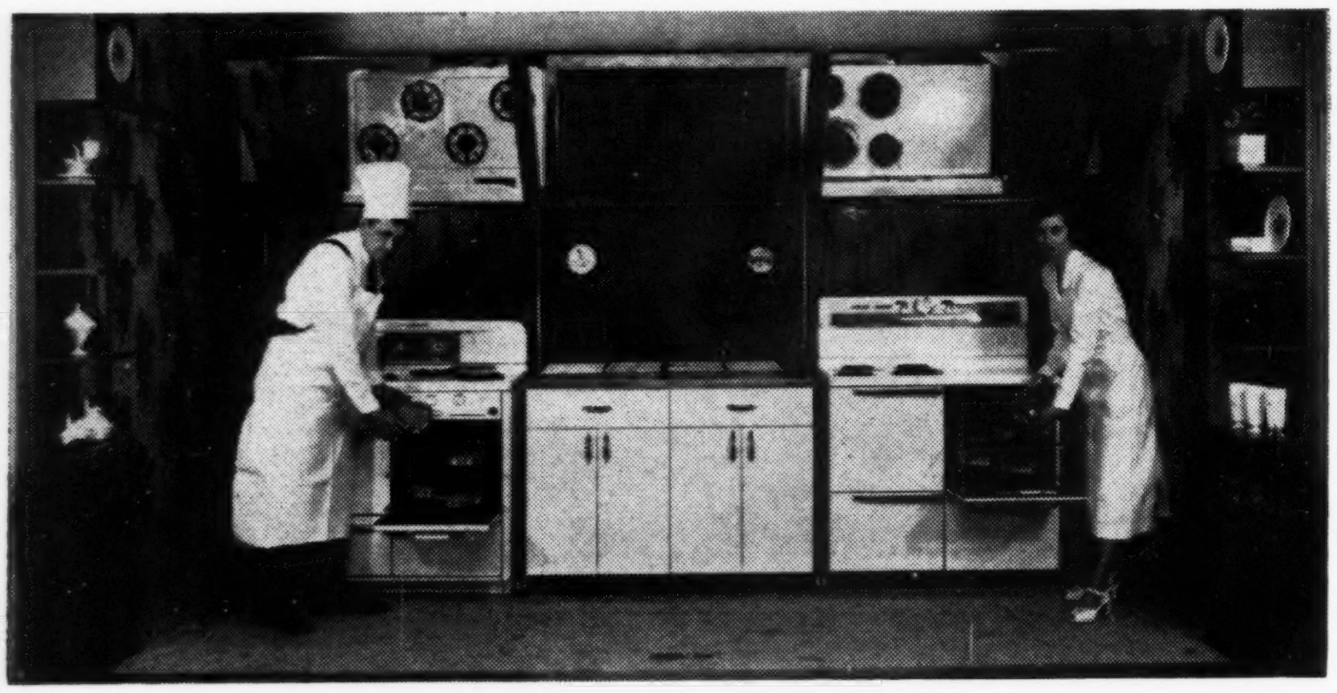
GAS REGULATOR CO.
ANDERSON · INDIANA · U. S. A.

Competitively—Gas Has Got It

To prove to its employees, dealers, and manufacturers that "Gas Has Got It," Southern Counties Gas Co. of California is currently winding up an impressive road show. Proving the superiority of gas ranges over competitive ranges in meeting the nine wants of the housewife, basis of Gas Has Got It promotion, the production may soon be shown before architects, general contractors, and school personnel.

Featured is a cooking demonstration on modern gas and electric ranges. A sincere attempt is made to make the comparisons as fair as possible, with no attempt being made to discredit other appliances—only misconceptions and extravagant claims. Each of the "wants" is demonstrated, step by step, to prove gas' advantages.

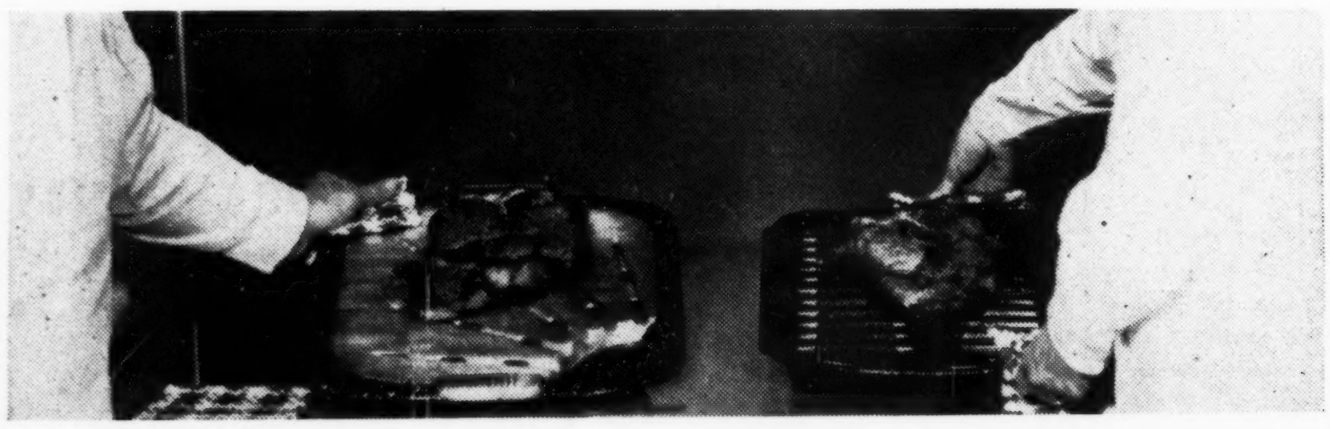
To date 42 showings have been held throughout the system.



Doris Streibich and Darrel Milton of the sales department demonstrate respective abilities of the gas range (left) and the electric range in baking cakes. Gas and electric meters (center) accurately gauged fuel consumption, proved gas economy.

A singing teakettle and a stop watch are used to prove that gas has the speed.

Test shows that spattering will occur in frying, regardless of heat source.



Results of a broiling test using thick porterhouse steaks demonstrate that the gas range is easier to use, to clean, and to keep clean.

Cashing In On A Logical Load—Ira J. Rapson, Michigan Consolidated Gas Co., Detroit. These excerpts are from a paper presented at the Eastern Natural Gas Regional Sales Conference in Pittsburgh, Pa., March 15.

One of the major appliances gaining wider recognition in the field of gracious living is the gas incinerator. This important appliance is beginning to enjoy more and more acceptance every day. No wonder! The demand for it is inherent in our present methods of garbage and refuse collection in all major communities . . .

However, there are two specific reasons why every dwelling place today does not have a gas incinerator. The first is habit, or tradition, if you want to call it that. One of the most difficult jobs in the world is changing a person's habits. It can be done, but it takes plenty of activated sales ability. The other reason is lack of information. How many families in the communities we serve would welcome and buy a gas incinerator, if they had all the information on what it would do for them, how simply it operates, how much safer and more sanitary it is?

Inform Prospects

How about the taxes some prospects now pay for garbage collection? That certainly could be an obstacle to selling the garbage disposer unit, but it is not. If the convenience of the appliance outweighs the nagging discomfort of the old techniques, the appliance is already half sold—just give the prospect all the information!

Against the obstacle of a new, perhaps strange, kind of convenience that runs counter to the habit of putting refuse in a can, we can set up the selling points of additional personal comfort, modernity, and pride of ownership in a visible and attractive appliance—that can be seen and admired by visitors, and the almost intangible but worthy benefits derived from more sanitary living conditions.

Along with destroying garbage, the modern gas incinerator does away with all burnable trash, making it a safety factor in the modern home . . . It complements gas, as a fuel, and protects more competitive loads. It adds to our base load. For instance, the on-and-off type incinerator adds 30 to 40 cu ft of manufactured gas, or 15 to 20 cu ft of natural gas per hour. The automatic dehydrating type incinerator adds approximately 3 cu ft of manufactured gas or 1½ cu ft of natural gas every hour of the day and every day of the year without adding a penny to capital investment. The low input permits the appliance to be installed and operated without increasing service pipe, manifold or meter size.

Trouble-free Load

From an operating viewpoint, the incinerator goes on year after year, without serious service problems. There is no added expense for meter reading, billing or bookkeeping. The incinerator is also a sales manager's dream, offering full profit, no trade-in, and an item that's easy to stock and deliver with a relatively low installation cost. Installation is simple and easily made. A single length of flexible, ⅜-in. copper tubing will supply adequate gas. The only other requirement is to connect the proper sized flue to the chimney and the appliance is ready to use.

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...a TRULY Forced Air
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...and you can employ duct work where necessary!
SECURITY
Yes, indeed . . . here is the answer to heating small homes without basements properly. Security's INN-A-WALL Furnace is entirely new in the field of forced air furnace heating. It requires a minimum of duct work for proper heat distribution. And saves space . . . needs only 16 by 20 inches floor area!
The INN-A-WALL reverses the usual flow pattern . . . warm air comes out at the bottom. This means warm floors! It is constructed so that warm air can be taken from all four sides, with return air being taken from the four sides at the top. Where ducts are required for distant rooms, permanent connection is made at the bottom. Casing height is 88 inches. The Security breather tube automatically supplies sufficient air for combustion.
Other outstanding values in the INN-A-WALL are ● Quiet-operating, positive blower ● Fully automatic operation ● Special Security high efficiency burners ● Complete adaptability to any floor plan (may be placed in the wall or stand alone) ● Amazingly economical in price.
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CONVERSION

cedure in choosing and selling incinerators:

First, we ran an observation test on several units. Second, we selected units for merchandising. We held sales meetings during which the need for such an appliance was dramatized and the methods of selling were thoroughly formulated. Next, we started a limited advertising program, using newspaper, billboards, direct mail media, and our own window and floor display space. This was done concurrently with an intensified on-the-sales-floor selling program.

Our experience and sales records were discussed with all manufacturers and distributors in our area, with the projected plan of developing a city-wide selling campaign. Our dealer contact men then told the opportunity story to all gas appliance dealers in our territory. We were anxious to win their endorsement of the plan and enlist their aid to expand the selling force, expand display and to build up potential advertising funds.

We cooperated with distributors to arrange installation facilities and train installation company employees at our own training center. At the same time, evening dealer meetings were held in our auditorium. These were sponsored jointly by the gas company, the distributor, and the manufacturer. Curriculum covered the need for incinerators, public acceptance, the market, profit, methods of selling the units and the use of cooperative advertising.

Distributor and manufacturer representatives sought out civic groups and government agencies such as clean-up committees, rat control committees, smoke abatement committees, the departments of public works and similar agencies, and began selling them on the money-saving factors involved, the need for improved sanitary conditions, and whenever possible installed the incinerators in the homes of the key persons in each group.

Press conferences and publicity releases resulted in widespread public notice. This program grew to the point where the governments of two cities seriously considered discontinuing garbage collection and purchasing incinerators for all dwellings. Although the plan turned out to be impractical in a community of some half-million homes, the publicity added considerable impetus to the incinerator sales campaign.

To keep the ball rolling in the right direction, there were additional dealer meetings, sales demonstrations on the dealers' floors, promotional displays and inspections to keep displays in good condition.

Besides the broad need for incinerators in a large city, another reason for promoting the units is their versatility. The incinerator is an appliance available for use with any type of gas. There are not one or two, but 10 different firms producing incinerators that are approved by AGA . . .

From the customer's standpoint, a gas incinerator is a highly desirable item. It consumes everything from eggshells, meatbones, and coffee grounds, to old magazines, and worn-out shoes. For sheer convenience, it competes with the refrigerator. It saves the cost of waste collection and the periodic replacement of unsightly garbage cans. It protects the family health, because the food scraps are disposed of before they become garbage to attract insects, vermin and rodents and because it robs flies and gnats of a feeding and breeding place.

It improves property value, improves the general condition of the neighborhood and adds prestige to the home.

DOWELL INC., Tulsa, Okla., concurrently with an announcement that Dow Chemical Co. has transferred to Dowell (a subsidiary) the marketing of magnesium anodes, Galvo-Pak, and Galvo-Line, issued a general information bulletin on magnesium anodes. Various types and forms of anodes available for cathodic protection are shown and described.

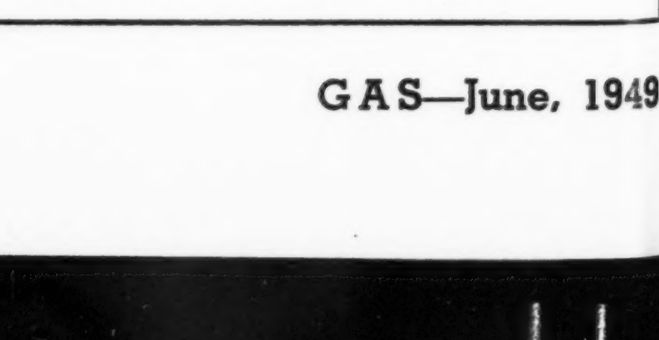
SERVEL INC. has released a new series of 14 newspaper ad mats for local use by dealers. The series is built around a trade-in campaign theme. According to R. J. Canniff, advertising and sales promotion manager, this special inducement advertising for dealers will be continued. The first series comes in two, three and five-column sizes.

"Because buyer resistance during the past few months has emphasized the need for attracting the best possible sales talent to the gas appliance industry," Mr. Canniff said, "Servel also has released a new portfolio titled, 'Finding a Good Salesman.'" It points up the difference between the man who *can* do the job, and that even better man who *will* do the job. Foundation of the program is "The Key to the Inner Man," a checking file for proper interpretation of information obtained from applicants. Hiring under the program is reduced to three steps—the "once over lightly" interview, telephone checkup on references, and the final analysis using "The Key to the Inner Man."

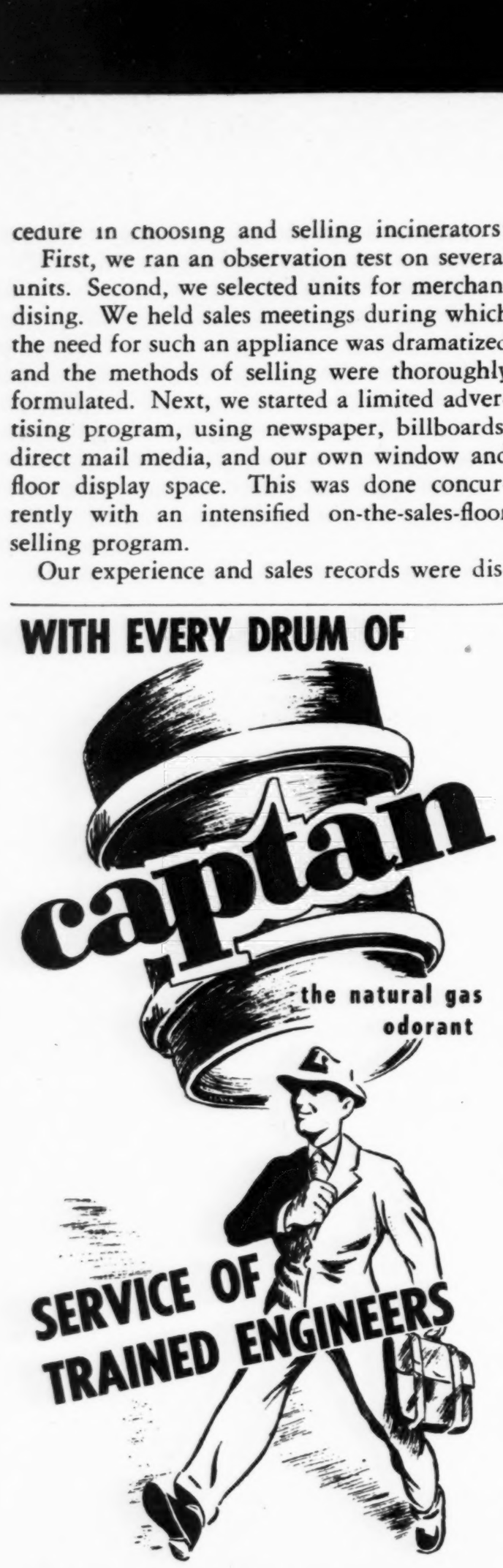
EIGHTY-SEVEN first quarter winners in the "Court of Flame" national gas water heater sales campaign have been announced. They were awarded U. S. Savings Bonds ranging from $300 to $25 denominations. According to Stanley C. Gorman, sales promotion director of the campaign, one of the most popular items for promotion in connection with the contest has been the newspaper mat service. Nearly 100 sets of mats have been ordered and the requests are still pouring into GAMA headquarters. Regional chairmen from eight major utilities have been appointed to accelerate the campaign.

U. S. PIPE & FOUNDRY CO. of Burlington, N. J., followed a late-April price reduction on its cast iron pipe and fittings with a second dip in general sales prices announced May 1.

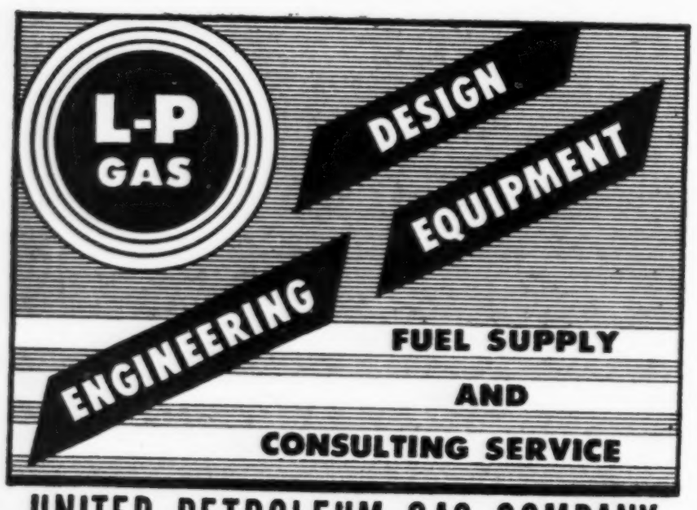
The first reduction amounted to $7 per net ton on all cast iron pipe and fittings; the second drop was for $4 per net ton, and was occasioned by a sudden sag in the prices paid for pig iron.



PORTLAND (ORE.) GAS & COKE CO.'s Rita Calhoun, home service director, is shown here with a class of 4-H Clubbers who are learning young the advantages of cooking with gas. They are in various stages of making ice-box cookies. Spring 4-H Club cookery classes are a tradition with this company. Nearly 150 children, aged 9 to 16, received instruction this year during three days of classes which included bread and cake baking.



NATURAL GAS ODORIZING CO., INC.
P. O. BOX 2464 HOUSTON 1, TEXAS



UNITED PETROLEUM GAS COMPANY
806 ANDRUS BLDG., MINNEAPOLIS 2, MINN.

FOR SALE

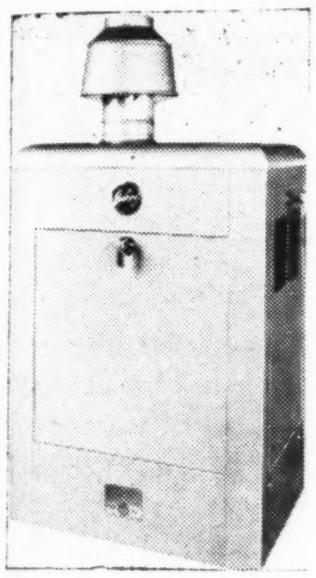
Used Carbureted Water Gas equipment, sets, compressors, blowers, pumps, boilers and tanks, etc. Inquiries and bids solicited. Write CENTRAL PENNSYLVANIA GAS COMPANY, Bellefonte, Penna.

NEW PRODUCTS

Water Boiler

BURKAY DIVISION, A. O. Smith Corp., Milwaukee, Wis.

APPLICATION: Designed for the efficient heating of small dwelling units.



DESCRIPTION: The boiler is 3 ft high, 2 ft wide, and 1½ ft in depth. It has a flexible input rating of from 70,000 to 110,000 Btu per hour. AGA approved, it is also approved for installation on combustible flooring.

Special features include a "water-wall" combustion chamber of copper tubing, a burner employing two stages of primary air input and a secondary air supply, a heat exchanger that exposes only two pints of water to 30 sq ft of tubing and fin, safety equipment with a high limit control, and electrical controls for all elements of the boiler.

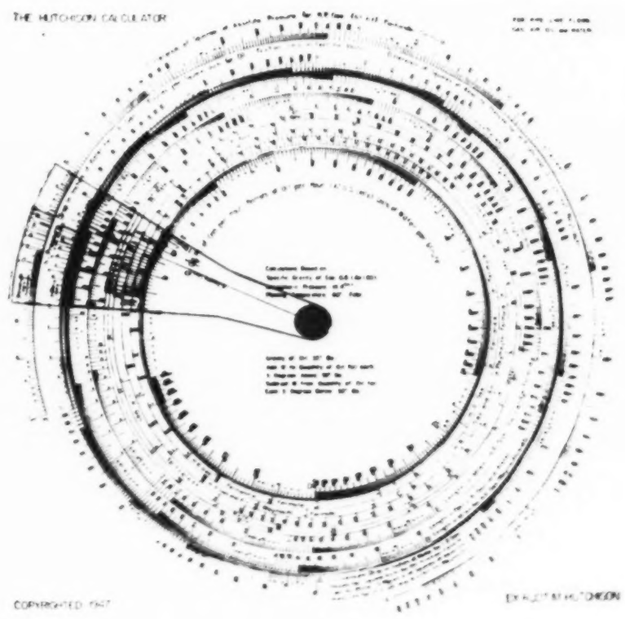
It is suitable for use with natural, manufactured or LP-Gas.

Flow Calculator

ROBERT M. HUTCHISON, Box 1188, Houston, Texas.

MODEL: Hutchison Calculator.

APPLICATION: For determining pipeline flows of gas, air, oil and water. It will solve problems in high-pressure gas pipeline flow by use of either the Panhandle or the Weymouth formula, and low-pressure gas and water flow by the Spitzglass formula. Pipeline flow of oil is determined through use of the National Transit formula. The calculator will also



correct for specific gravity of gas and for pressure base in gas problems, as well as for interval distribution in high or low-pressure gas or water systems.

DESCRIPTION: The Hutchison calculator was copyrighted in 1948 by its designer, who is director of research for Houston Natural Gas Corp. The device is printed in two colors on Vinylite and carries its values on a circular

SHOW OVEN HEAT

TO PROMOTE SALES . . . Visually demonstrates advantages of better constructed, better insulated ovens.

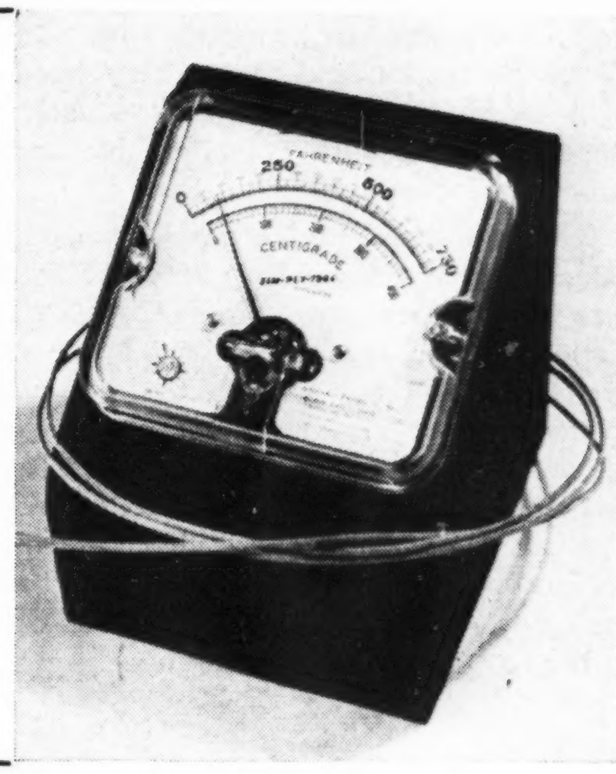
TO SPEED SERVICE . . . SAVES up to 30 minutes on service and adjustment of oven controls.

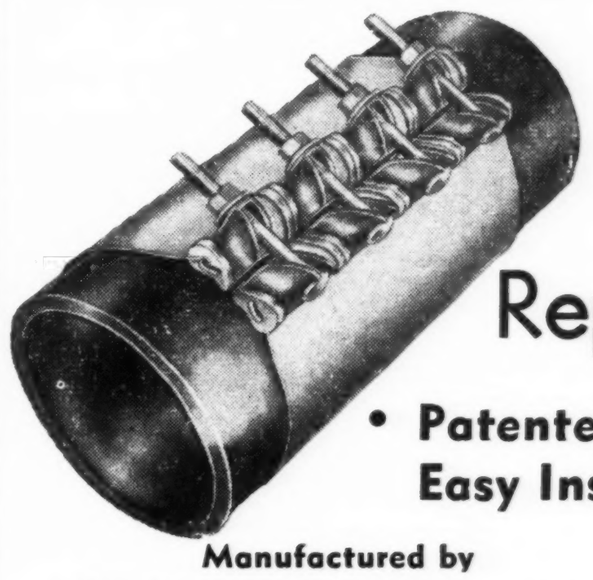
The SIMPLYTROL Oven Thermometer for accurate reading of oven temperature without opening oven door. Reads up to 750°F, or 400°C.

Model 1654-A, illustrated.....$21.00
(Complete with thermocouple wire)

Order today, or write Dept. G-1

ASSEMBLY PRODUCTS, INC.
CHAGRIN FALLS, OHIO





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STREET CITY ZONE STATE

unit. All scales are protected with a transparent lamination and cannot be rubbed off. It is made in one size, 10 in. square, and comes complete with pressure table and instructions for its use.

Although based on certain assumed basic values of specific gravity, atmospheric pressure and temperatures, simple algebraic corrections enable results obtained to be interpreted to cover any given set of conditions. Corrections are also given for gravity of oil differing by as much as 3°, Baume, either way from the oil used as basis in the formulae. The calculator is accurate within the limits of the ordinary slide rule, and is equally useful for field and office flow computations of any of the types of pipeline throughput.

Pipe Burners

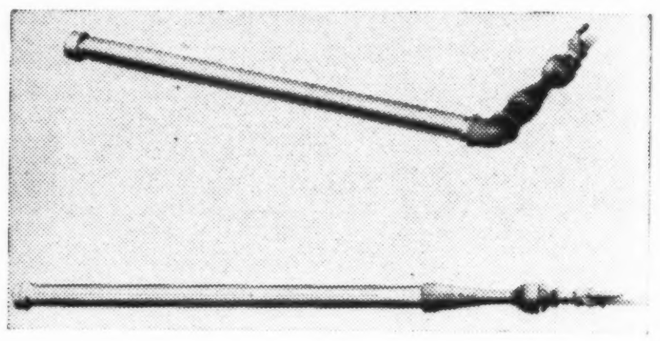
BRYANT INDUSTRIAL DIVISION, Affiliated Gas Equipment Inc., 1020 London Rd., Cleveland, Ohio.

DESCRIPTION: Engineered in three types for use with natural, manufactured or LP-Gas, the pipe burners have properly sized and spaced ports for the most efficient use of combustion air and for low turndown without flashback.

The pipe burners are equipped with Bryant Lojector venturi mixers, with or without gas cocks. These mixers are of heavy-duty construction with integral cast mounting lugs. Orifice spuds may be inspected or changed using only screw driver and pliers.

The burners are available with either single-row or double-row port drilling. A mounted torch pilot or spark plug ignition unit may be supplied if desired.

The size range covers ⅜-in. to 4-in. pipe with flame lengths from 6 in. to 132 in. Btu



capacities per hour range from 10,000 to 300,000. Selection of the proper burner for a specific use is possible by means of capacity-selection tables in Data Sheet 1A-6, available from the company on request.

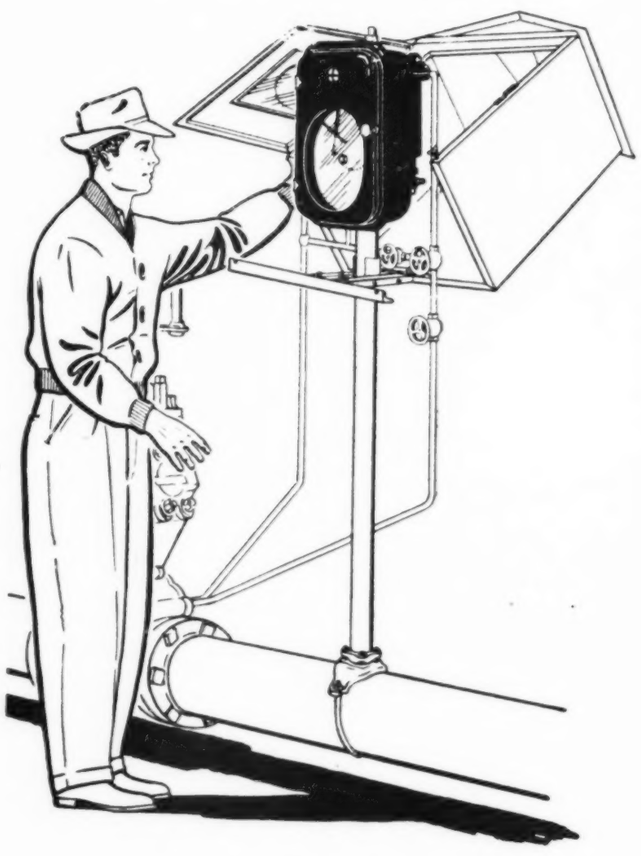
Orifice Meter House

GORDON Z. GREENE CO., 2335 E. 8th St., Los Angeles 21, Calif.

MODEL: TiltBack.

DESCRIPTION: The TiltBack meter house is fabricated from 22-gauge sheet metal and is shipped in knock down form. The sides, back and top are bolted together, and the lower part of the house has a welded frame made from 1½-in. angle iron. This makes the entire assembly rigid when in use.

A round steel bar 10 in. long is welded to the frame, allowing the meter house to shift



laterally, thus making possible proper positioning over various type meters. This steel bar, being the axis of a hinge arrangement, allows the house to "tilt back" in order to facilitate making the necessary repairs and calibrations to the instrument.

Space is provided for extra charts, ink bottles, etc. Glass-covered opening in the door is available for a slight additional charge. The entire meter house is painted with a gray baked enamel. Dimensions when assembled are 26 in. wide, 18 in. deep, and 32 in. high. Weight is approximately 40 lb.

The Immortal Match....

Here's an instrument that's been around for a long time. No matter how many complicated gadgets are invented to replace it, the match is still an efficient means of starting fires at the lowest possible cost.

In the same way, Iron Sponge has been the leading gas-purification material for over 74 years. Nothing can take its place for the high efficiency and economy it combines.

Among the advantages of Iron Sponge are—extra high activity and capacity, maximum absorption, longer periods between necessary recoverings, fast comeback, low initial costs, low maintenance costs. Iron Sponge is ideal for high or low pressure purification, and high or low H2S concentration or mere traces.

Take advantage of Connelly's experience and engineering facilities. If your problem is gas-purification, consult Connelly.

Other Connelly products include:

CALOROPTIC

A simple, inexpensive instrument for continuous direct readings and BTU control applied to manufactured, natural, propane, and butane air gas. Available assembled with photo-cell for signalling and mounted in control panel for automatic operation.

SMYLY H2S TESTER

A patented device for quick, accurate tests using pretreated paper discs.

CONNELLY pH TEST KIT

A complete simple outfit for making pH determinations. Includes universal indicator solution, test tubes, color chart and full directions. Handy 3″ x 5″ pocket carrying case.

CONNELLY, Inc.

3154 S. California Ave., Chicago 8, Illinois

Elizabeth, N. J. Los Angeles, California

Application of Compressibility Factors In the Estimation of Gas Reserves

By E. B. ELFRINK*, C. R. SANDBERG,* and T. A. POLLARD*

COMPRESSIBILITY factors† of natural gas and condensate systems are used extensively in the decline curve, the volumetric, and the material-balance methods of gas reserves estimation. The misuse or nonuse of compressibility factors in any of these methods results in sizable errors of estimation. No attempt will be made here to cover the use of compressibility factors in all methods of reserves estimation. Other authors[1] have covered in some measure the use of compressibility factors in the decline-curve method. However, this discussion will deal only with the volumetric method, the formula for which is:

$$Q = \frac{43{,}560 \times \phi \times (1 - S_w) \times 379.3 \times Z_1 \times P \times E.R.}{Z_2\, RT}$$

where

E.R. = equivalent ratio =

$$\left[\frac{\text{cu ft gas}}{\text{cu ft gas} + \left(\dfrac{\text{bbl. oil} \times 5.615 \times 379.3}{\text{sp. vol. of oil} \times \text{mol. wt. of oil}}\right)}\right]$$

P = reservoir pressure, psia

PpR = pseudo-reduced pressure

PtR = pseudo-reduced temperature

Q = cu ft of gas in place per acre-ft at 60°F and 14.7 psia

R = 10.73

S_w = interstitial water content of reservoir, expressed as a decimal fraction

T = reservoir temp., °R 459.6 + °F)

Z_1 = compressibility factor of produced gas at 60°F and 14.7 psia (can be determined from *Fig. 1* by using left ordinate)

Z_2 = "compressibility" factor of entire system at reservoir conditions

ϕ = porosity, expressed as a decimal fraction

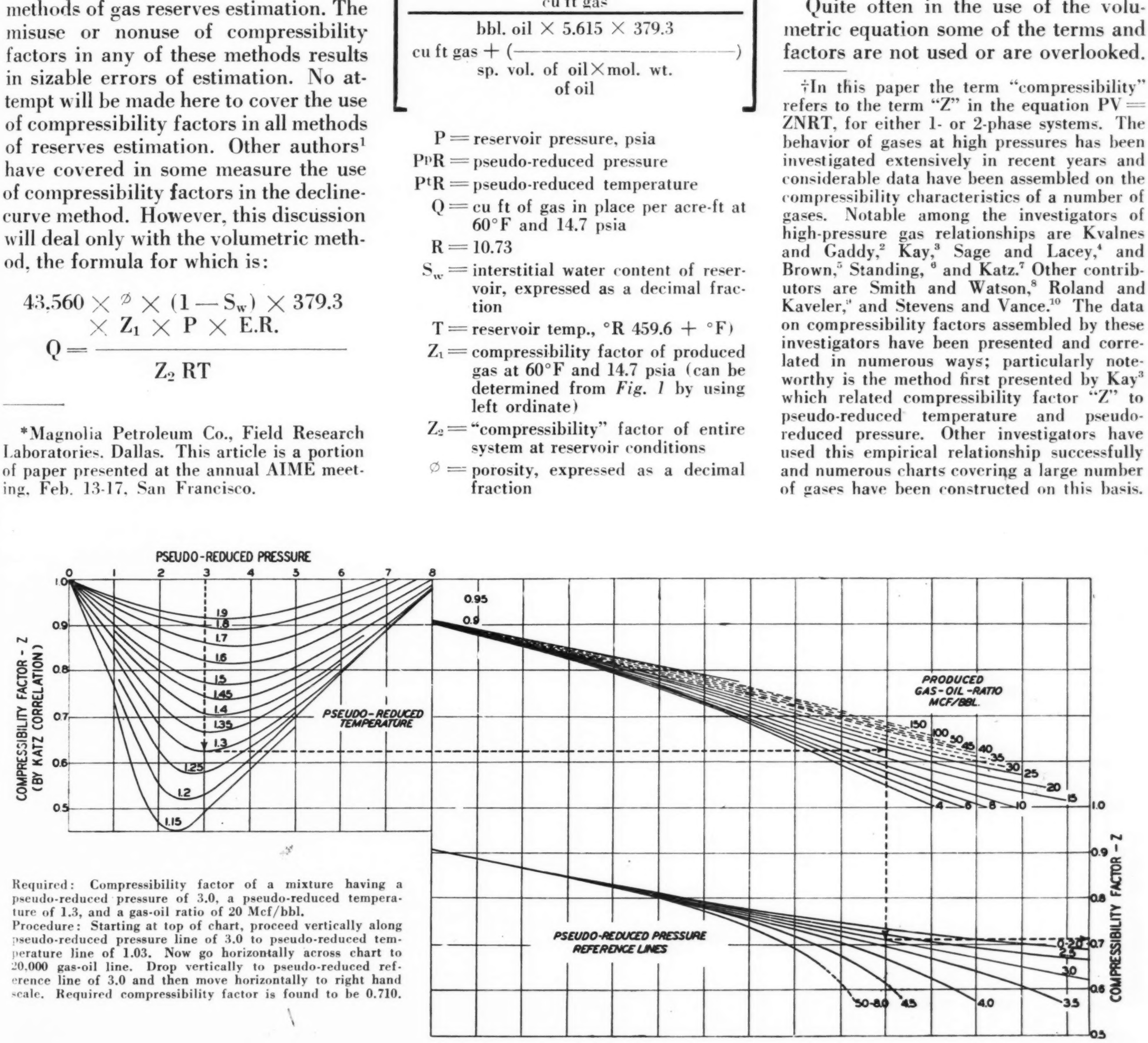
379.3 = volume in cubic feet occupied by 1 lb mol of gas at 60°F and 14.7 psia

43,560 = cu ft per acre-ft

Quite often in the use of the volumetric equation some of the terms and factors are not used or are overlooked.

*Magnolia Petroleum Co., Field Research Laboratories. Dallas. This article is a portion of paper presented at the annual AIME meeting, Feb. 13-17, San Francisco.

†In this paper the term "compressibility" refers to the term "Z" in the equation PV = ZNRT, for either 1- or 2-phase systems. The behavior of gases at high pressures has been investigated extensively in recent years and considerable data have been assembled on the compressibility characteristics of a number of gases. Notable among the investigators of high-pressure gas relationships are Kvalnes and Gaddy,[2] Kay,[3] Sage and Lacey,[4] and Brown,[5] Standing, [6] and Katz.[7] Other contributors are Smith and Watson,[8] Roland and Kaveler,[9] and Stevens and Vance.[10] The data on compressibility factors assembled by these investigators have been presented and correlated in numerous ways; particularly noteworthy is the method first presented by Kay[3] which related compressibility factor "Z" to pseudo-reduced temperature and pseudo-reduced pressure. Other investigators have used this empirical relationship successfully and numerous charts covering a large number of gases have been constructed on this basis.



Required: Compressibility factor of a mixture having a pseudo-reduced pressure of 3.0, a pseudo-reduced temperature of 1.3, and a gas-oil ratio of 20 Mcf/bbl.
Procedure: Starting at top of chart, proceed vertically along pseudo-reduced pressure line of 3.0 to pseudo-reduced temperature line of 1.03. Now go horizontally across chart to 20,000 gas-oil line. Drop vertically to pseudo-reduced reference line of 3.0 and then move horizontally to right hand scale. Required compressibility factor is found to be 0.710.

COROMAT PROVED UP TO 300% STRONGER BY ACTUAL FIELD TESTS BEFORE EXPERTS

TULSA, April 4—Before a group of 32 pipeline operators, engineers, and owners today, the new, stronger "Coromat"; the improved underground pipe wrap, was announced by Owens-Corning Fiberglas Corporation and demonstrated by their company engineers and by service engineers from Midwestern Engine & Equipment Co., Tulsa, Oklahoma, distributors of Coromat.

Owens-Corning experts explained that the new "Coromat" was developed to meet the need for an inorganic pipe wrap in longer length rolls than heretofore used by the industry and with increased tensile and tear strengths sufficient to allow application by "over-the-ditch" coating and wrapping machines at increased speeds and with fewer starts and stops.

The new "Coromat" material is as much as 300% stronger than conventional-type glass pipe wraps, has up to twice the resistance to transverse tear,

HERE'S HOW NEW, BETTER

"COROMAT"

THE IMPROVED UNDERGROUND PIPE WRAP

CUTS COSTS FOR YOU

Your wrapping crews can apply this new stronger "Coromat*" the improved underground pipe wrap *faster* . . . as much as 150% faster. And with practically a zero incidence of breaks in each 400-foot, 800-foot or 1200-foot roll . . . that means less starting and stopping of wrapping machines and less patch-work resulting from such stops. The new "Coromat" is almost 300% stronger than ordinary glass-type pipe wrap material, has specially designed glass-yarn reinforcing that vastly increases resistance to transverse tear.

And you still get all the cost advantages that you have been getting with the previous Fiberglas* Underground Pipe Wrap made by Owens-Corning . . . greater penetration of the wrap by the bitumen, lighter weight than any organic pipe wrap of comparable properties, complete freedom of the glass-mat wrap from rotting, complete inertness to the bitumen coating, and maximum reinforcing of the bitumen coating by the strong glass fibers and yarns that form "Coromat".

"Coromat" is the newest product of Owens-Corning Fiberglas research and engineering, has been tested in the lab and in the field. *Write today* for free samples of "Coromat" and a copy of the technical book "Corrosion Control for Underground Pipe". Write to OWENS-CORNING FIBERGLAS CORPORATION, Dept. 942, Toledo 1, Ohio. Sales offices in 27 leading cities.

FREE SAMPLE

FREE BOOK

OWENS-CORNING

FIBERGLAS

T.M. REG. U.S. PAT. OFF.

*Fiberglas (Reg. U. S. Pat. Off.) and Coromat are the trade-marks of Owens-Corning Fiberglas Corporation for products made of or with glass fibers.

"COROMAT" PIPE WRAP

TABLE 1. COMPARISON OF CALCULATED AND MEASURED SPECIFIC VOLUMES FOR A CONDENSATE MIXTURE

Pressure, psia	$\frac{P}{P_R}$	Z from Katz	Z from Fig. 1	Per Cent Diff. in Compress	Sp. Vol. cu ft/lb. (Computed, Katz)	Sp. Vol. cu ft/lb. (Computed, Fig. 1)	Sp. Vol. cu ft/lb. (Measured)	Phase
5000	7.794	0.962	0.962	0.0	0.03760	0.03760	0.03748	1-Phase
4500	7.015	0.892	0.892	0.0	0.03874	0.03874	0.03885	1-Phase
3500	5.456	0.0750	0.790	5.3	0.04188	0.04411	0.04395	2-Phase
3000	4.676	0.686	0.747	8.9	0.04469	0.04866	0.04887	2-Phase
2500	3.896	0.635	0.726	14.3	0.04964	0.05675	0.05696	2-Phase
2000	3.118	0.599	0.724	20.9	0.05853	0.07074	0.07074	2-Phase

T = 160°F; PtR = 1.273; gas-oil ratio = 6241 cu ft/bbl

It has been the practice in some cases to use the compressibility of the produced gas at surface conditions and to neglect any correction for the liquid present. In the above equation, the equivalent ratio (E.R.) makes this correction. The gas in place can be overestimated by not using the equivalent ratio. This over-estimation can be as great as 15% for systems of low gas-oil ratio (4000-5000 cu ft per barrel).

The errors resulting from the complete omission of the compressibility factor from the volumetric calculation can be quite large. The per cent underestimation of the gas in place becomes greater as the gas-oil ratio of the system is decreased, and can be as large as 50% in a 6000-gas-oil-ratio system existing as two phases at 3000 ft. Errors as large as 20% may exist for single-phase systems. Nevertheless, accurate results can be obtained for these systems by using *Fig. 1*, if the total system composition is known.

The use of compressibility factors in the volumetric equation does not completely eliminate all sources of error. The Katz compressibility factors for gaseous systems cannot always be applied to systems of low gas-oil ratio where conditions are such that a liquid phase is present at the temperature and pressure considered. Overestimation of gas in place results from using gas (single-phase) compressibility factors for systems that are two-phase. Such errors would be minimized by using the chart presented in *Fig. 1*.

Fig. 1 has advantages over the normal single-phase compressibility charts in that it can be used safely in both single (infinite gas-oil ratio) and two-phase regions. This chart can also be used with the Katz chart (included as part of *Fig. 1*) to indicate the presence of liquid in a system of known composition, at reservoir conditions. Any marked difference in compressibility factors from the two charts is a satisfactory indication of liquid being present in the system at the state point chosen. This is illustrated by examples given in *Table 1*. It is believed that this usage of *Fig. 1* will be of considerable value in indicating whether a condensate system is at or below dew point at reservoir conditions, in the absence of complete PVT data.

A sample calculation of gas in place for an actual condensate system, using *Fig. 1*, is presented in *Table 2*. Comparison of the result of this calculation with one using single-phase compressibility values shows that in the latter case a sizable overestimation of the gas in place would have resulted. Appropriate adjustments must, of course, be made in the final reserve estimates for effect of unrecoverable liquid phases left in the reservoir, for two-phase systems.

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TABLE 2. EXAMPLE OF GAS-IN-PLACE ESTIMATION USING FIG. 1 AND THE KATZ CORRELATION

Given:

Reservoir pressure, P = 2500 psia
Reservoir temp., T = 150°F
Porosity, ϕ = 0.30
Interstitial water content, S_w = 0.23
P_pR (total prod. at res. cond.) = 3.89
P_tR (total prod. at res. cond.) = 1.25
P_pR (prod. gas at std. cond.) = 0.02179
P_tR (prod. gas at std. cond.) = 1.259
Prod. gas-oil ratio = 6241 cu ft/bbl
Trap gas day = 2,754,000 cu ft
Vent gas day = 223,116 cu ft
Tank oil day = 447 bbl
Sp. vol. of tank oil = 0.021314 cu ft/bbl
Molecular wt. of tank oil = 120.06

A. Using Fig. 1

$$Q = \frac{43{,}560 \times \phi \times (1-S_w) \times 379.3 \times Z_1 \times P \times E.R.}{Z_2\ RT}$$

Z_1 from *Fig. 1* = 0.996; Z_2 from *Fig. 1* = 0.720

$$E.R. = \frac{2{,}977{,}116}{2{,}977{,}116 + \frac{(477 \times 5.615 \times 379.3)}{(0.021314 \times 120.06)}} = 0.8823$$

$$\therefore Q = \frac{43{,}560 \times 0.30 \times 0.77 \times 379.3 \times 0.996 \times 2{,}500 \times 0.9923}{0.720 \times 10.73 \times 609.6} =$$

1,781,300 cu ft gas/acre-ft

B. Katz Chart

Z_2 from Katz chart = 0.623

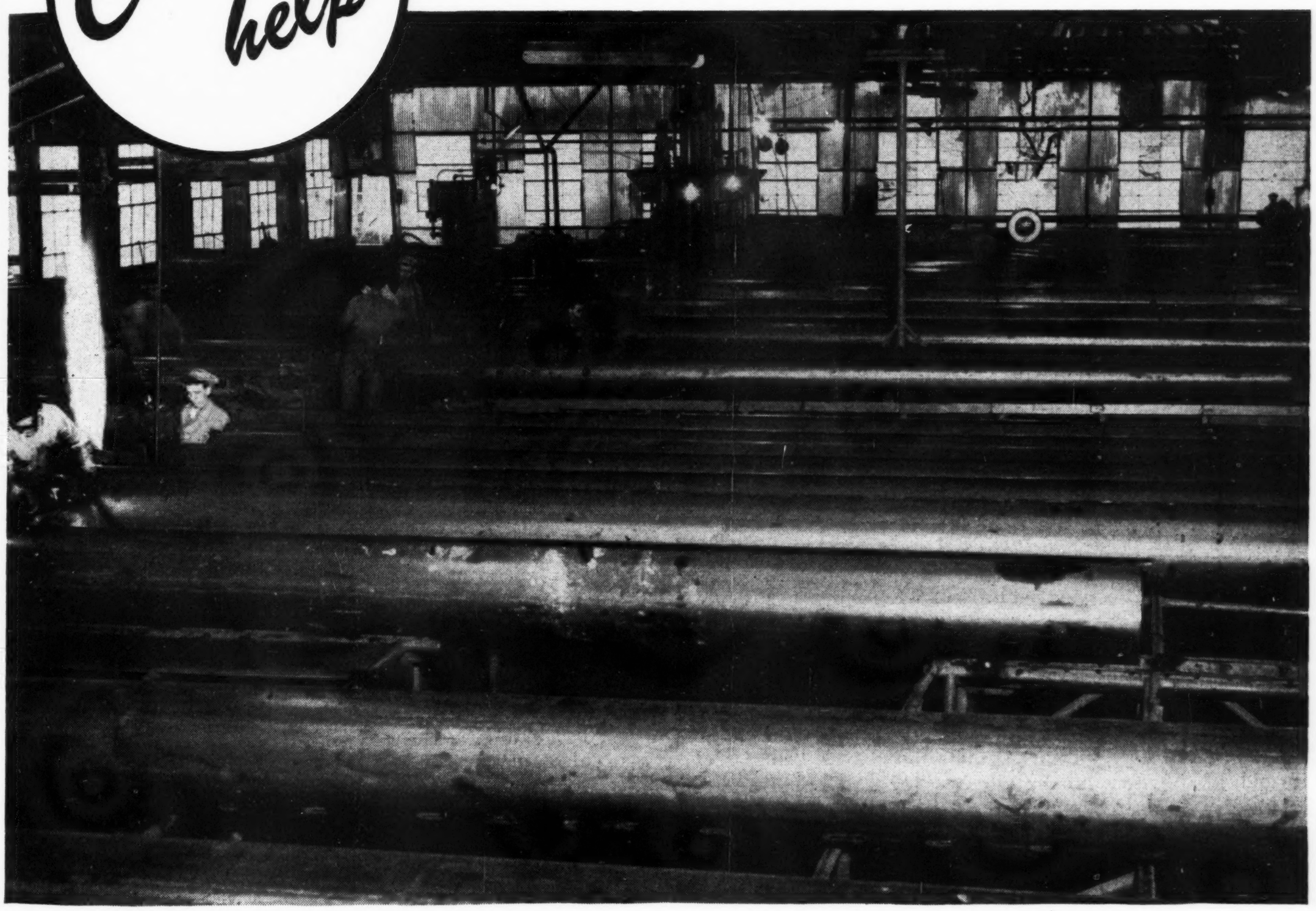
$$\therefore Q = \frac{43{,}560 \times 0.30 \times 0.77 \times 379.3 \times 0.996 \times 2{,}500 \times 0.8823}{0.623 \times 10.73 \times 609.6} =$$

2,057,475 cu ft gas/acre-ft.

$$\text{Per cent over-estimation} = \frac{2{,}057{,}475 - 1{,}781{,}300}{1{,}781{,}300} \times 100 = 15.6$$

Can we help

with your steel pipe requirements?



present daily production = 1 mile

Using an automatic submerged arc weld process, Master Tank is daily producing over 5,300 feet of 20″ O.D. welded steel pipe — *just one of the sizes we can produce.*

Only the most modern equipment and production methods could attain such volume.

Other important factors are knowledge and experience.

For many years Master Tank has been known, and highly regarded by industry, for their ability to produce.

Perhaps our expanded facilities can help with your pipe requirements. Why not write or call us.

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New Mill Helps Break Pipe Bottleneck in Texas

A pipe-hungry oil and gas industry is welcoming a new star on the industrial horizon in the Southwest. The Master Tank & Welding Co. of Dallas is in full production on its pipe fabrication program which includes production of 10-in., 20-in. and 30-in. line pipe in sections as long as 30 ft, and larger diameter pipe in 18-ft double jointed sections for 36-ft requirements.

Exclusive

Pipe fabrication was begun by this plant in August last year when the firm tooled up for the production of 75 miles of 20-in. line for the Lone Star Gas Co. With a fast-growing territory for which pipe requirements were exceeding supply from regular sources, Lone Star turned to the new home industry for fulfillment of at least a portion of its needs.

First Order

To date the new production source has completed the first order for pipe to build the company's new transmission line from east Texas to the Dallas-Fort Worth area. The new line is being completed this spring. In the meantime Lone Star has placed additional orders for 50 miles of pipe to extend the 20-in. line around Dallas metropolitan area connecting to the transmission system between Dallas and Fort Worth, and for another line from Riesel to the company's new compressor station at Groesbeck in south Texas.

The new east Texas line currently under construction will have a delivery capacity of 200 MMcf of gas daily and will extend from Henderson county to a point east of Dallas where it ties into Lone Star's 5262-mile transmission system. It will supplement gas supply now coming in from east Texas and will furnish an additional supply from the Carthage, Opelika and Tyler fields.

Contractor on the job is the Eastern Construction Co. of Dallas. The additional orders for 20-in. pipe will take care of the extension of this particular line to tie into the company's transmission system on a 16-in. main between Dallas and Fort Worth.

Master Tank & Welding, to handle its new product, has greatly enlarged the shop, which formerly was devoted entirely to producing pressure tanks and butane and gasoline transport truck tanks. From a one-man shop established for contract welding eight years ago, the firm has grown to one employing 200 men and covering property which includes 32 acres for present and future shop expansion. The present facilities cover 10 acres. The original 20 x 36-ft building leased by Sam Weempe for his contract welding shop is part of the present real estate occupied by the firm.

Mr. Weempe, now in partnership with Carl Casey, is general manager of the firm and C. L. Young is assistant manager.

When the pipe fabrication was begun, following a successful period of manufacturing practically everything in the line of pressure vessels for the liquefied petroleum industry, the partners sought a pipe press that would handle their needs. Unable to buy such a press, they set to work to design and build one.

The Press

The present press, designed by Mr. Weempe, is thought to be the largest of its type in the world, with a distance of 30 ft and 6 in. inside the housing and an overall span of 41 ft. The top beam on the press weighs 75,000 lb and is designed to form 40-ft sections of pipe without flexing. The top beam makes the press distinctive among equipment of its type.

The press is hydraulically operated, is driven by one 400-hp electric motor and one 353-hp diesel motor, and is capable of forming one 30-ft pipe section per minute. The press can form a 30-ft joint of 20-in. pipe in two strokes. Equipped with a change of dies, the press will handle anything from 10-in. to 30-in. pipe. On smaller diameter pipe, section lengths can be increased from 30-ft to 40-ft lengths.

Sheet steel is conveyed into the press after it leaves a shearing and breaking machine, where edges are given a preliminary "break" ahead of the press operations. After the pipe has been formed in the press, it is ejected by hydraulic cylinders out of the large unit where conveyors pick it up and carry it on to the tack-up jigs. Here, hour glass rolls pull the pipe edges together along the seam for tack welds. From here it goes to the automatic welding machines where submerged arc welding is uesd. Next step is the round-up press where ends are rounded after which the sections proceed to the straightening press.

After the pipe has been straightened it is conveyed to the beveling lathes where both ends are simultaneously machine-beveled to the desired degree. Lone Star Gas Co. requires a 30° bevel, which is in general use. Pipe is now ready for testing, which is done on a hydraulic machine which brings the pipe beyond its yield to complete the rounding process, after which pressure is reduced to the required hydrostatic test pressure. The test is made at 1000 lb but pressure can be raised above this figure if such tests are required. From here the pipe is conveyed to yard racks for shipments by truck or rail to construction areas.

More Equipment

As production of line pipe increases, the Dallas firm will be prepared to handle additional pipe contracts simultaneously with new equipment which they are setting up. The new equipment will handle the rolling of larger diameter pipe than is now being produced.

The firm has been manufacturing 100-lb ICC cylinders for several years and initial production schedule was 50 a day. Under current plant operations the schedule is between 1000 and 1400 per day. In line with this phase of their operations, the concern is installing additional deep drawing equipment. The equipment includes furnaces, shears, presses, punches and other units for drawing ICC cylinders, motor fuel tanks, air receivers and other drawn products. A specially equipped machine shop where dies and other machine equipment are made has been installed and it was here that the pipe former and cutters were made and the huge pipe press constructed.

For photographs of the new mill with its huge press, and the first pipe produced there, please turn to p. 94.

Where the country is rough and the hills rugged, and cumbersome heating kettles can't be conveniently used on the line, cold applied NO-OX-ID coatings for underground pipe protection offer the most convenient, positive assurance against corrosion.

NO-OX-ID "GG," a chemically inhibited, pliable coating, can be easily applied cold, by hand. As a protective shield, No. 4 NO-OX-IDized Wrapper, a high tensile strength, laminated, moisture-resistant, reinforced fabric, can be easily handled by a coating crew. This wrapping keeps the NO-OX-ID in intimate contact with the pipe.

A tough, plastic service coat of NO-OX-ID Filler Red "C," brushed on cold by hand, completes a conveniently applied, three-way combination of perfect underground pipe protection for maximum service and minimum equipment where the going gets rough.

NO-OX-IDs are versatile coatings—for hot or cold climates, for hot or cold applications, easy to use under any conditions.

Dearborn Engineers, located conveniently throughout the country, will be glad to discuss these and other NO-OX-ID combinations with you, or write Dearborn Chemical Company.

Pipe Coating in rough country is easy with NO-OX-IDS

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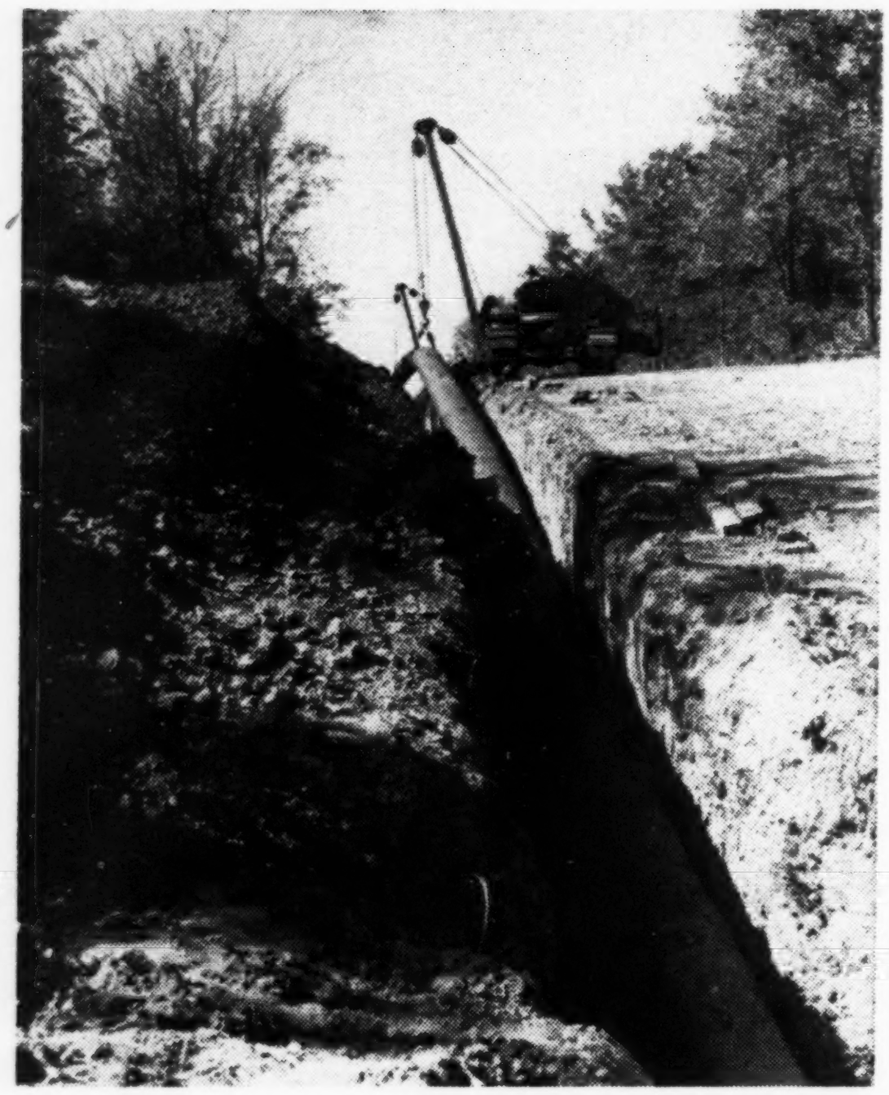
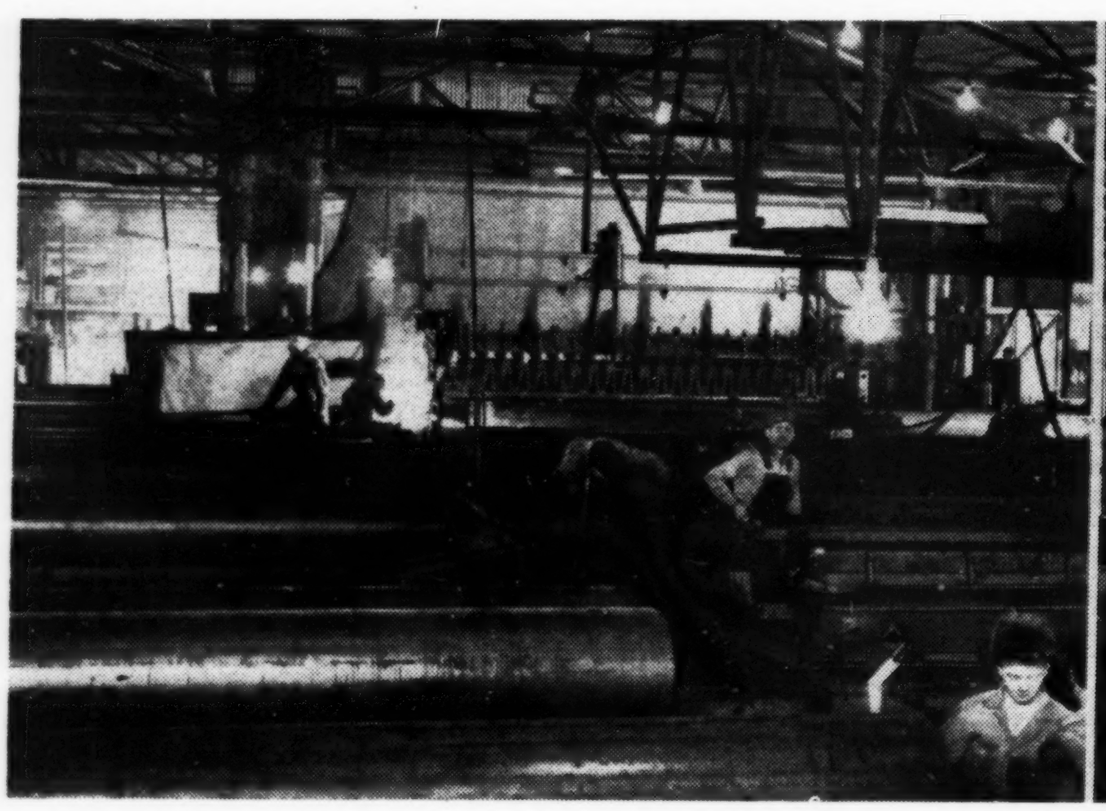
The New Pipe Mill That Helped Break Shortage in Texas

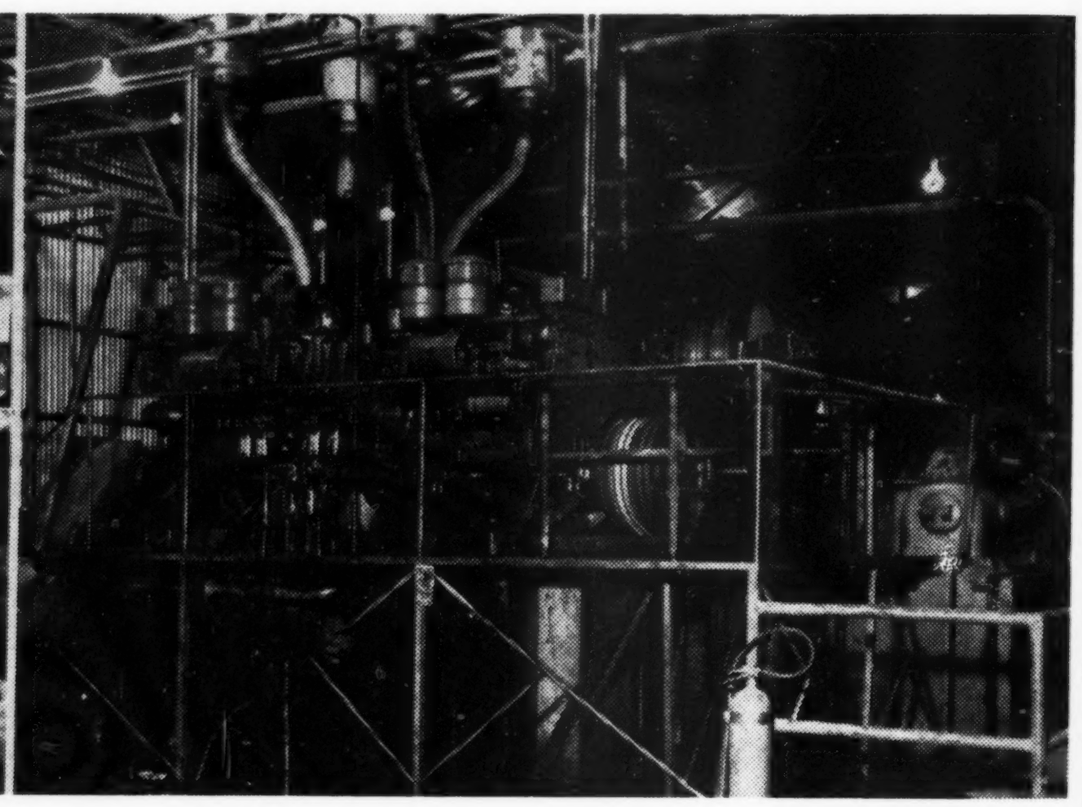
(See p. 92)



Construction photo at left, taken on Lone Star Gas Co.'s 20-in. line from east Texas to the Dallas-Fort Worth area, shows pipe fabricated at the new Dallas plant of Master Tank & Welding Co. New line has a delivery capacity of 200 MMcf, reaches 75 miles into east Texas to tie company's 5262-mile transmission system into supplemental gas supply in Carthage, Opelika, and Tyler fields.



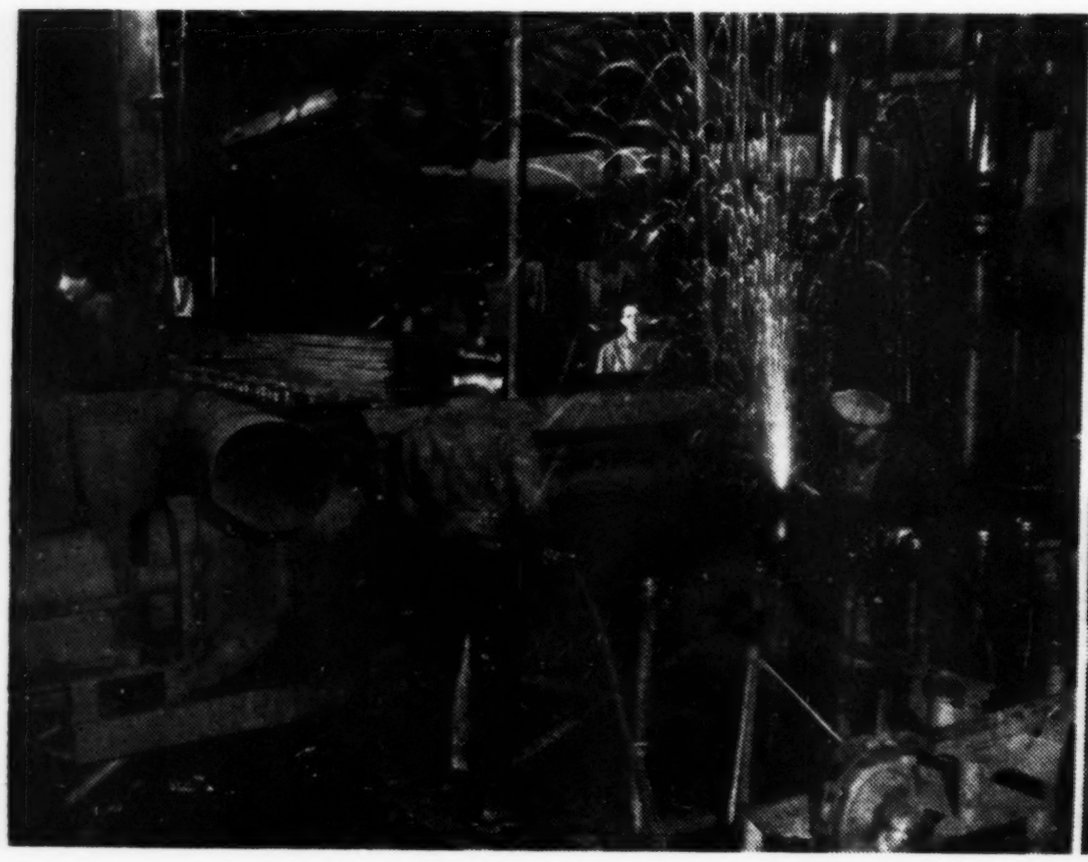
Overall view of plant where the pipe was fabricated shows a pipe press in the right background, and shearing and breaking center and beveling operation in the right foreground.

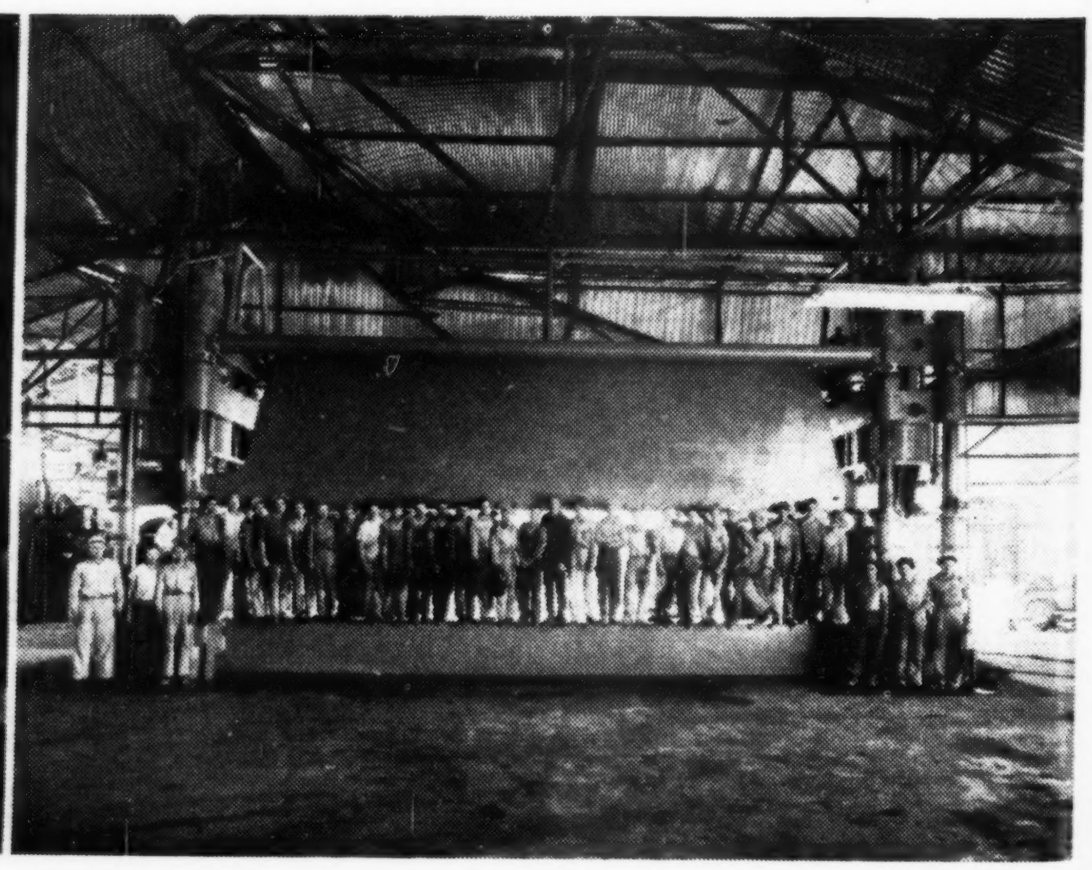


Diesel motor, rated at 535 hp, one of two power units operating the huge press, capable of forming a pipe section a minute. It will stamp out 30-ft length of 20-in. pipe in two strokes.

Sheet is automatically conveyed from breaking machine, where edges are turned for pipe formation, to side of pipe press where it is carried through forming process on hydraulic cylinders.

Thirty-four employees span new $250,000, 1000-ton pipe press. Measuring 41 ft in length, it will turn out 30-ft sections of 20-in. and 40-ft sections of smaller diameter pipe.





PIPELINE NEWS

Trunkline's Texas-Nebraska 711-Mile Project Okayed

FPC authorization came last month for the 711-mile pipeline which will be built by Trunkline Gas Supply Co. from Edge, Texas, to Palmyra, Neb. The 26-in. line is to be completed no later than October 1951.

The new line will carry some 250 MMcf daily north for sale to supply Northern Natural Gas Co., who will resell it in areas of Nebraska, Iowa, Minnesota, and South Dakota. All told, Trunkline estimates the cost of building its facilities at a figure just over $84.3 million.

Included in plans for the project are 711 miles of 26-in. main line, 810 miles of lateral supply lines running from the gas fields of Texas and Louisiana gulf area, and seven compressor stations with an aggregate horsepower of 44,800.

At a saving of about $8 million to participating companies, FPC commissioners accepted the Edge-Palmyra routing of the line in preference to an ultimate course which would have run from a point about 200 miles east of Lake Charles (La.) to Keokuk, Iowa. The commission pointed out that the second route would up Trunkline's construction estimate by $5 million, and add $3 million to Northern Natural construction expenses.

A secondary discussion in the final hearing on the proposed facilities was instigated by customers of Northern Natural, a spokesman for whom questioned the commissioners as to whether Northern Natural would include gas delivered on the new Trunkline system in its existing rate schedule, or charge a separate list of prices for the new gas delivered. FPC declined to give a final ruling on the question, since that controversy was not a part of the pipeline-approval proceedings.

Alberta Passes Export Firms' Incorporation Bills

While the picture is still confused by indecision, dispute, and delay, it is appearing increasingly likely that one day the Northwest will be burning gas that originated underground in the province of Alberta, Can.

Last month, several concrete steps were taken in this direction. First, five pipeline companies were incorporated by an act of the Canadian Parliament — Westcoast Transmission Pipe Line Co., Trans-Northern Pipe Line Co., British American Pipe Line Co., Western Pipe Lines, and Interprovincial Pipe Line Co. Incorporation of a sixth company — Alberta Natural Gas, was blocked by Canada's Socialist party — the Cooperative Commonwealth Federation — by a procedure device: refusal of unanimous support to suspension of house rules needed to get the six bills of incorporation passed.

In fact, CCF countered with a bill of its own, which would ban private ownership of oil and natural gas pipelines, but it was voted down 141-31.

After calling for division on a bill to incorporate a second line, CCF withdrew its active opposition and after registering protest allowed that bill and the other four to move through second reading.

Then Westcoast lost no time in announcing that it was starting survey work immediately, incidentally predicting that it would have a pipeline to the United States in operation within two years.

The line, according to Frank McMahon, president of Pacific Petroleums, Ltd., one of the organizers of Westcoast, will run 1400 miles, and consist of 30-in. pipe. Through passes in the Canadian Rockies, it would move gas to Vancouver, B. C., and thence south through Washington and Oregon as far as northern California. Cost is estimated at $175 million for the entire project, including the American end of the line, which would have to be approved by the Federal Power Commission and built by a separate company (Northwest Natural has long had its bid in). The Canadian portion alone would run about 1000 miles, according to the plan, and would cost upwards of $100 million.

Sunray Oil Corp. is also an organizer of Westcoast, and the New York banking firm of Eastman, Dillon & Co. would finance it.

Completion of the picture still awaits the action of either Dominion or Provincial government, or both. The three-man natural gas reserves commission, formed many months ago, recently submitted its findings, which were encouraging to those seeking export. Over 4 trillion cu ft in proved reserves were estimated, and projections of future findings ranged as high as 28 trillion. While Alberta's consumption in 1948 was 37.3 billion, by 1960 it is expected that local demand will double. Canadian distributors have plugged hard for a postponement of export approval until a 50-year supply for the province alone can be assured.

Whether Alberta or the dominion government has jurisdiction was still in doubt last month. Alberta's Premier Manning cited confusion on this point, and promised to push provincial legislation to clarify it.

"The time may well be at hand to allow the export," he said.

Gas for Atomic Energy Plant

Strong representations by the Atomic Energy commission were almost the sole deciding factor in FPC approval of the delivery of 60 MMcf to the atomic energy plant in Oak Ridge, Tenn., last month, an FPC spokesman said.

Tennessee Gas Transmission Co. will build the 1155-mile, 30-in. looping on its existing lines necessary to connect with a line to be built by East Tennessee Natural Gas Co., which in turn will run about 172 miles eastwardly to the plant. East Tennessee's line will be of 22-in. diameter.

TGT's costs on the project will total $14 million, including added facilities for compression. East Tennessee will pay about $9.4 million for its part of the new line.

East Tennessee was ordered to start its construction for the line no later than June 15, and to proceed at such a rate as will insure completion by Jan. 15, 1950. TGT must complete its part of the job in order to be able to supply gas to the AEC by Sept. 1, 1950.

Harper Bid Takes WAA Line

A bid in excess of $5 million has been received by WAA for the 100-mile surplus natural gas pipeline in Louisiana. The bid, submitted by A. B. Harper of Fort Smith, Ark., was highest of eight bids received late in April.

The line, which runs from Lake Charles, in southern Louisiana, and serves several small bayou communities, has a WAA "fair value" of $6.5 million, since it is already a going concern. Union Sulphur Co. operates the line for the government currently.

Bids for the line range from Harper's $5 million to $1.5 million, an estimate submitted by G. A. Butler of Houston. Closest bid to Harper's is the $4,108,000 amount received from the Mississippi River Fuel Corp.

Boosters for Cities Service

Cities Service Gas Co. of Oklahoma will build new compressor facilities furnishing 4790 additional hp along its partially completed line from the Kansas-Hugoton gas field to Kansas City (400 miles). The company received FPC approval last month for the project, to be completed at a cost of $1.2 million.

The compressor proposal was submitted to FPC as a part of its four-year program, instituted in 1946 and including the Hugoton-Kansas City line. In addition to the compressor facilities okayed, Cities Service also received permission to abandon its Hutchinson compressor station, no longer needed because of the high pressure gas now available in the Hutchinson area from the Hugoton-KC line.

Wisconsin Southern Buys Line

Wisconsin Southern Gas Co. has received an FPC okay to acquire a 25-mile pipeline between Pleasant Prairie and Genoa City, Wis., from Wisconsin Gas & Electric Co.

Further, the commission approved a plan whereby Wisconsin Southern will build a 1.65-mile line to join the facilities of the Natural Gas Pipeline Co. of America, from which company Wisconsin Southern may now purchase gas. Such purchases must not be made in such a quantity as to exceed Natural Gas Pipeline's allocation under current rate schedules, however.

Wisconsin Southern will pay $180,000 for the 25-mile line.

Big Inch Tops Half Billion

The Big Inch delivered an average of 474 MMcf daily during the month of March, and reached a peak of 514 MMcf on April 1, according to announcements made to stockholders in their annual meeting recently.

R. H. Hargrove, president of Texas Eastern Transmission Corp., operators of the line, said that in spite of the huge volumes being transported, the line loss was less than 1% of gas.

Construction to increase the company's capacity to 740 MMcf along the Big Inch (as approved by the FPC) is now in progress,

Hargrove said. The expansion includes roughly 260 miles of pipeline, and alterations of compressor equipment; its cost is estimated at $24 million.

Operating revenues for the company took a mammoth jump to $11.2 million for the first quarter of 1949, pushing last year's profit for a like period ($6.7 million) into the shadows.

Reconditioning Contract Let

Contracts for taking-up, reconditioning, and relaying of 65 miles of 12-in. natural gas pipe have been awarded by the Oklahoma Natural Gas Co. to the Trojan Construction Co. of Tulsa.

The line, to be started on June 15, will run between Chandler and Blanchard, Okla., and is scheduled for completion Sept. 1.

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Colorado Interstate Plans

Additional facilities which would increase present capacity by 62 MMcf daily have been petitioned by the Colorado Interstate Gas Co. in an application now in FPC authorization channels. Present company capacity in its lines, running from the Panhandle and the Kansas Hugoton fields, to Denver, is 264 MMcf.

Additional facilities necessary to handle the increase would include 38 miles of 20-in main line looping on the Hugoton line, installation of three 1200-hp compressor units at the Hugoton field, and construction of a new compressor station (with seven 1200-hp compressors) on the Hugoton line in Cheyenne county, Colo.

The project will cost $4,328,930, which the company says it can pay from cash on hand.

Hagerstown Seeks Connection

Hagerstown (Md.) Gas Co. has applied to the Federal Power Commission for an order directing Manufacturers Light & Heat Co., Pittsburgh, to connect its facilities to those of the Maryland company, as agreed upon by the two companies in 1946.

To date, Hagerstown spokesmen said, they have been unable to get deliveries from Manufacturers. The connection would require that each of the companies build a 6-mile line to Manufacturers' transmission line in southern Pennsylvania. The request was based on the Hagerstown contention that the expansion of its present manufactured gas facilities is not financially feasible, and that the Maryland company would be unable to make a fair return on its investment without the addition of natural gas from the Manufacturers lines.

More Gas for San Angelo

Increased gas for the community of San Angelo, Texas, will be the result of the 10-in. line now under construction by Lone Star Gas Co., which runs 17 miles from Runnels county to San Angelo.

The new line parallels the company's existing 8-in. line "R," bringing additional gas from Eden field.

Lone Star's Permian Lease

More than 15,000 acres of land in the Permain basin of west Texas have been leased by the Lone Star Gas Co., Vice President E. F. Schmidt told stockholders in a meeting last month. The area, he said, is "more likely to yield oil than gas" but that the company will have as one of its objectives the production of casinghead gas for the growing industrial area of west Texas.

Stockholders at the Pittsburgh meeting were also told that Lone Star had added about $20 million in additions to property in 1948, and that a like amount is to be expected in expansions this year.

Company directors declared a dividend of 30 cents, payable June 13 to record May 27.

Natural Gas for Las Vegas?

A new pipe company, the Nevada Natural Gas Pipe Line Co., has been formed to supply the southern Nevada area with natural gas. The proposed route of the line is from a take off from the El Paso Natural Gas Pipe Co. line near Topock, Ariz., to Las Vegas, Nev., via Boulder City and Henderson, Nev.

The line will take care of the needs of Las Vegas and the industrial load at Henderson, where the government-built basic magnesium plant is located. The plant was recently turned over to the State of Nevada.

Atlanta Increases Output

A $300,000 natural gas pipeline that will increase service to the areas of Marietta, Smyrna, and north Atlanta, all in Georgia, was recently under construction for the Atlanta Gas Light Co. by Williams Bros., engineers.

The line has a total length of 4½ miles, including about 1½ miles of submarine pipe (under the Chattahoochee river) and will boost supplies to the Georgia Power Co. in Smyrna.

* * *

Arkansas-Louisiana Gas Co. has asked Federal Power Commission approval of a plan to build 163 miles of 20-in. pipeline from Weskom field in northeastern Texas to Columbia county, Ark., and thence to Prela, Ark.

To cost an estimated $8 million, the project would include submarine crossings of the Little Missouri, Ouachita, and Red rivers, and three bayous; and aerial crossings of two creeks and a canal.

* * *

A two-way emergency communications system has been announced as in operation for the southern division of the Public Service Co. of Northern Illinois.

Bell Telephone Co. installed all the equipment for the new system, which includes six transmitting stations (Joliet, Harvey, Kankakee, Streator, Pontiac, and Lacon). Sixty-five of the company's trucks are now capable of sending and receiving radio messages, thus being fully equipped to deal with emergency problems anywhere along the lengthy reaches of the company's facilities.

* * *

Price fixing of natural gas from the Guymon-Hugoton field was voted down by the Oklahoma state legislature early last month. The state senate killed a bill, 21-17, which would have given the state corporation commission the authority to control prices in the field.

A two-year-old order of the commission, setting the price at seven cents per Mcf, is still under appeal in the state supreme court.

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PIPE LOCATOR

FINDS THOSE PIPES!

- Gives EXACT location of buried pipes, mains, services, gates, tees, ells, stubs, etc.
- Easy, reliable one-man operation
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- Featherweight — only 11 lbs. complete
- Guaranteed superior performance

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Pipeline People

J. L. JONES has been named acting district manager of United Gas Pipe Line Co.'s Shreveport district, replacing F. E. LACAZE, who has retired after 37 years of service with United Gas and its predecessors. Mr. Lacaze has served as Shreveport district superintendent or manager since 1919, and Mr. Jones, who joined a United Gas predecessor in 1929, has been Mr. Lacaze's assistant for the past eight years.

FRANKLIN S. WADE, president of Southern California Gas Co., Los Angeles, recently was honored for outstanding service in bringing Texas gas to supply the vital needs of the southern California area. A "certificate of merit for outstanding community service" was presented by the Southern California Financial Writers Assn. The honor previously had been conferred on only two men.

JAMES W. HEPBURN recently was appointed assistant manager of the vertical turbine pump division, Worthington Pump & Machinery Corp., Harrison, N. J. Mr. Hepburn's headquarters will be in Denver, and he will work in the territories west of the Mississippi, plus Chicago, St. Paul, and New Orleans.

FRANK D. MATHIAS has been appointed head of the treasury department of Panhandle Eastern Pipe Line Co., Kansas City. Mr. Mathias became associated with the company in 1930 and recently has served as assistant treasurer. He succeeds the late C. D. Jellings.

A. DEE SIMPSON, National Bank of Commerce of Houston, has been elected to the Tennessee Gas Transmission Co. board of directors. He will fill the vacancy created by the recent death of HERVEY M. AMSLER.

Progress Reports

TEXAS GAS TRANSMISSION CORP. has a 101-mile, 26-in. gas pipe running from Sharon, La., to a point on the Mississippi river near Lake Village, Ark. Work was started May 1 by the Latex Constrnction Co.; actual pipe-laying was scheduled to begin May 25.

THE ARGENTINE GOVERNMENT has announced completion of the 59.6-mile San Antonio Oeste-General Conesa section of its 1100-mile pipeline between Buenos Aires and Comodor Rivadavia, on the Golfo San Jorge. Construction (in two spreads) is under the direction of the government's Direccion General Del Gas Del Estado, who encountered the difficult problem of bridging the wide (985-ft) Rio Negro in the northern spread. Compania Tecnica Internacional is building the southern spread of the line. With the difficult San Antonio-General Conesa section finished, government officials believe the two-year job of building South America's longest gas pipeline is within reaching distance of completion.

TRANS-CONTINENTAL GAS PIPE LINE CO.'S first section was laid near Laurel, Miss., in special ceremonies May 16. It was the first work on the 30-in., 1840-mile line Trans-Con is building to stretch from Mercedes, Texas, to New York.

PANHANDLE EASTERN PIPELINE CO. is building 114 miles of 26-in. line loops from the Kansas Liberal fields to Emporia. Work is being carried out by R. H. Fulton & Co., Lubbock, Texas. Work is 90% complete. The same contracting firm has completed 10% of the 74½-mile, 26-in. looping job for Panhandle in Kansas. It has one spread.

CITIES SERVICE GAS CO. started 130 miles of 26-in. line from Hutchinson to Ottawa (Kansas) on April 10. R. H. Fulton & Co. is the construction firm.

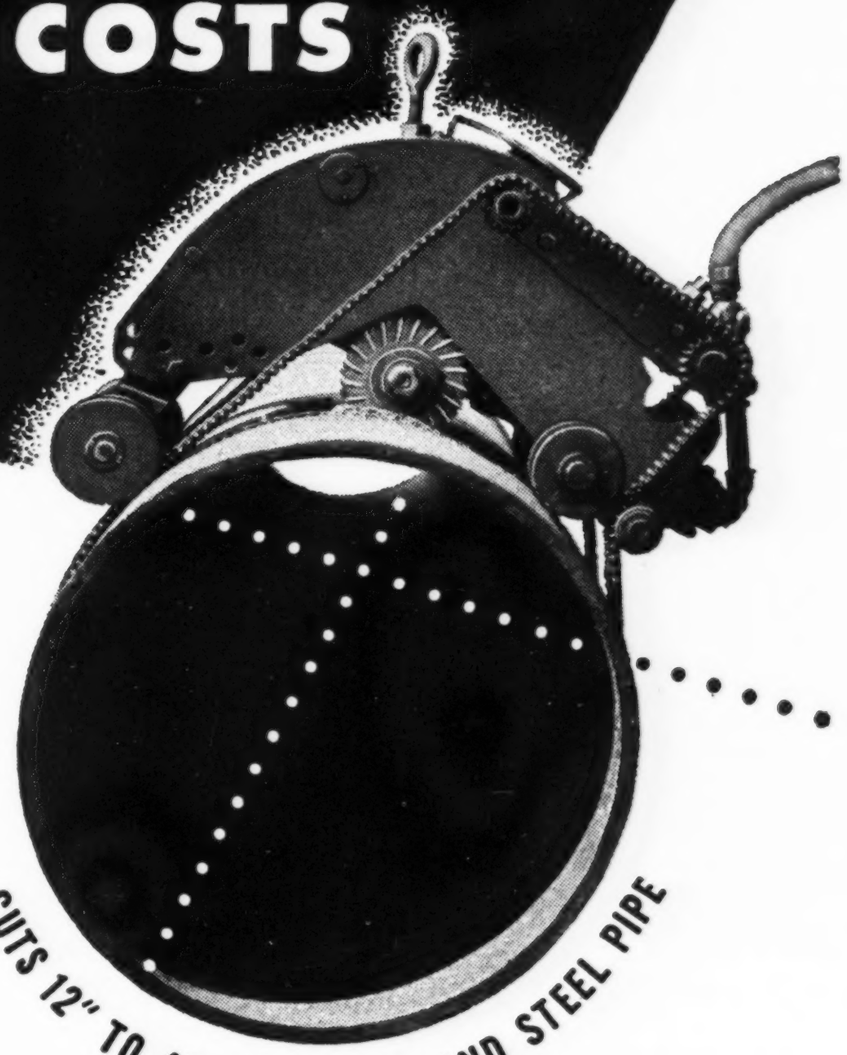
MICHIGAN-WISCONSIN PIPELINE CO.'S 180-mile, 22-in. pipeline in Michigan was started April 15 by the Oklahoma Contracting Co. Inc. and is scheduled for completion Oct. 1. About 10% is now completed on the one-spread job.

TEXAS GAS TRANSMISSION CO. has 10% completion on its 102-mile, 26-in. line in Kentucky. The one-spread job was started May 1 by the Oklahoma Contracting Co. Inc., and is scheduled for completion by Oct. 1.

CANADIAN RIVER GAS CO.'S gas gathering system, 50 miles northwest of Amarillo, was completed May 13 by Z. J. Graham of Amarillo. The facility consists of 24,000 ft of 4-, 5-, and 6-in. line.

WACHS NATIONAL PIPE SAW

CUTS PIPE CUTTING COSTS



TIME AND COST CUTTING FEATURES

- Minimum Pipe Line down time.
- Cuts under water in flooded ditches.
- No broken pipe, milled cut.
- Thor Air-Powered, no flames near pipe.
- Set-up time about 15 minutes.
- Portable—weighs only 265 lbs. Two men can carry and set up unit.
- Small excavation—only 14" clearance needed in ditch.
- One machine cuts all pipe sizes from 12" to 48".
- Only two adjustments necessary for size changes.

The Wachs National Pipe Saw is actually an air powered milling cutter that travels around the pipe on two silent type chains which act as a flexible ring gear, assuring positive feed and compensating for pipe bulges. This fast, accurate, labor saving saw makes the complete milled cut in one revolution at a travel rate of 2" per minute.

Write today for descriptive folder and engineering data on this new labor saving saw.

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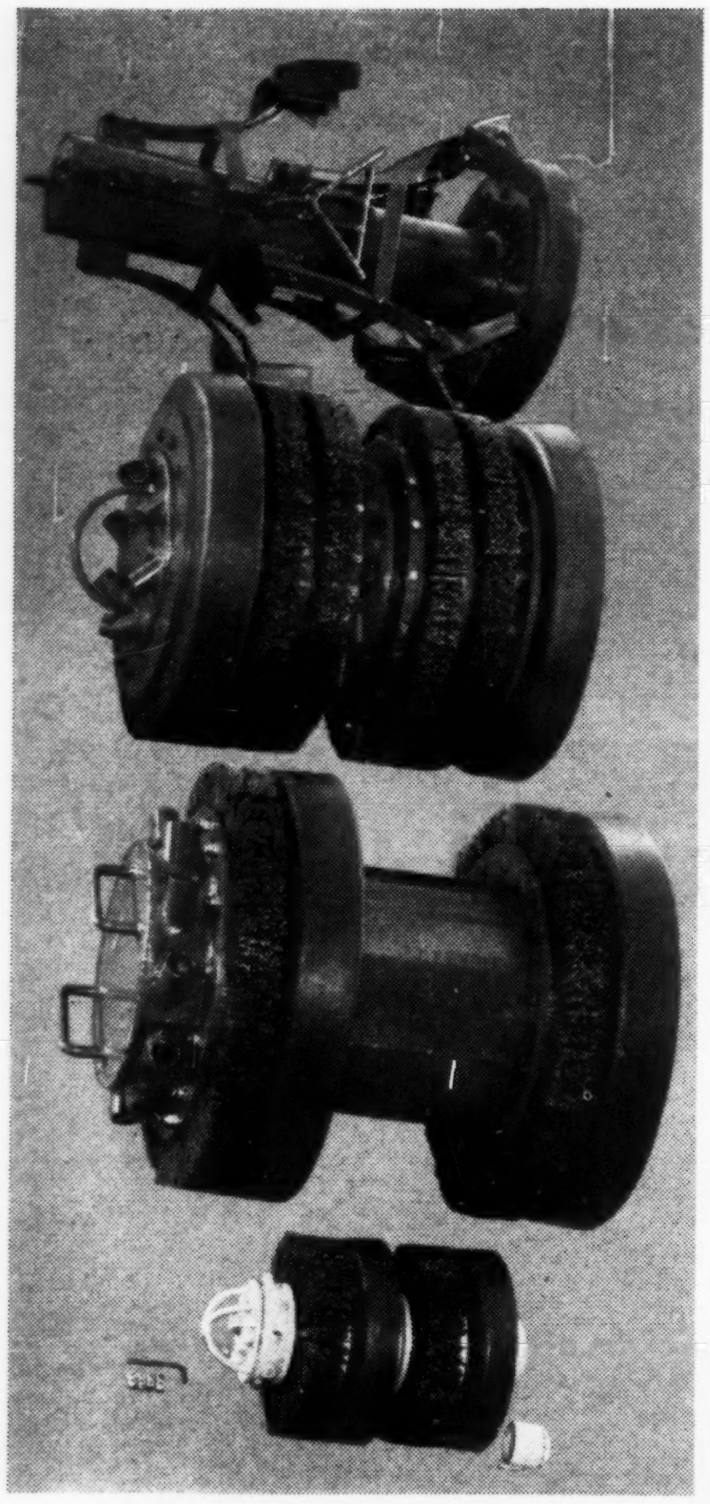


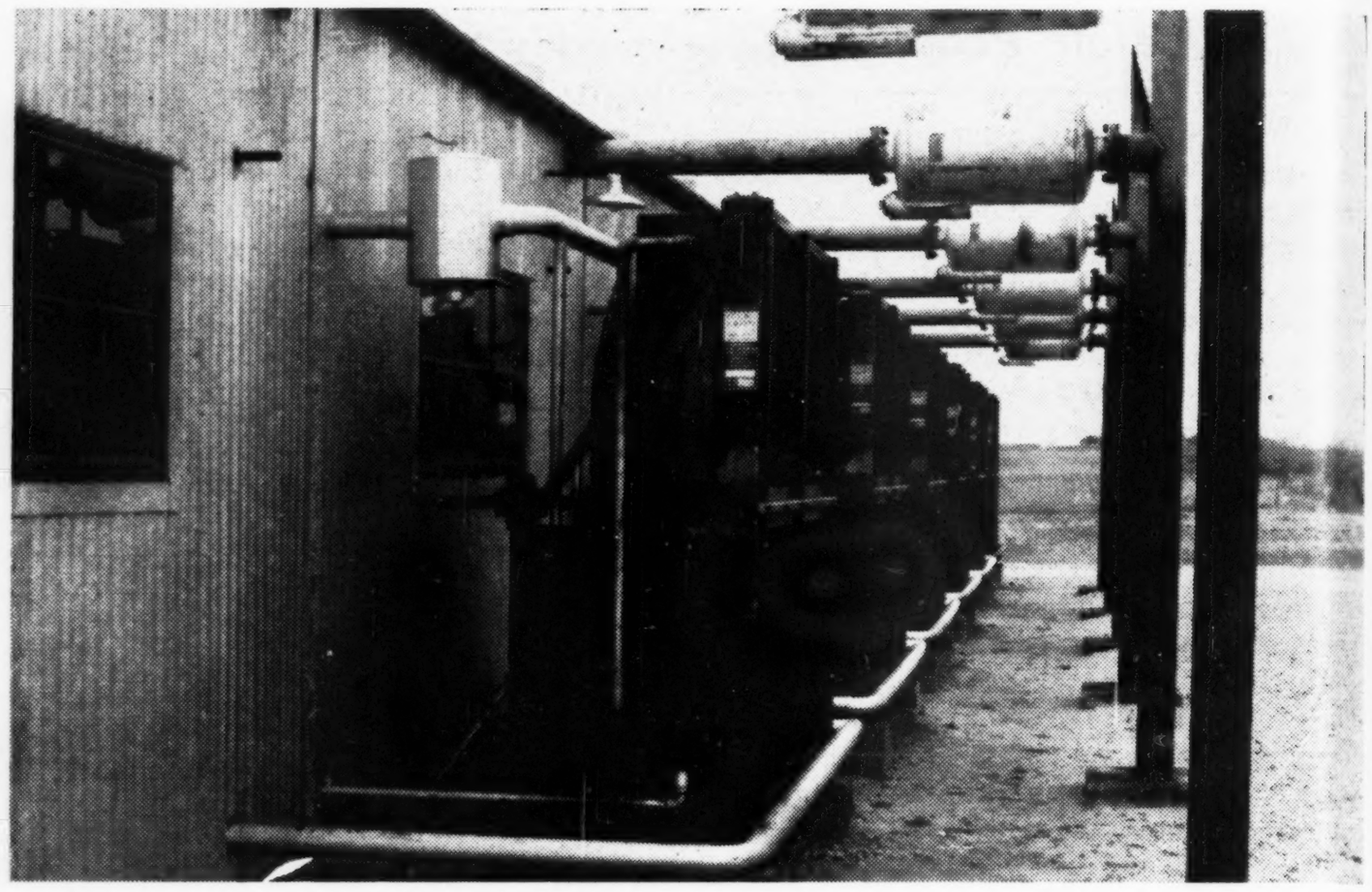
A Pig For Every NATURAL GAS Pipe Cleaning Project

ILLUSTRATED ARE THREE WILLIAMSON PIGS* FOR CLEANING 24" LINES, ONE FOR 10" LINES

- (Top) **Plow-Type** Scraper for cleaning old, extremely dirty gas lines. Followed by Brush-Type Pig for final cleaning operation.
- (2nd) **Type RN-1** Pig with 2 sets of rotation nozzles; by-pass gas purges brush bristles; brushes may be shimmed to compensate for wear.
- (3rd) **Type RCN-1** Pig with single row of rotation nozzles; new compact design for traversing long-radius factory ells. Light weight construction.
- (4th) Small size, **Type RCN-1** Pig, improved model will negotiate sharp bends; equipped with nozzle plugs for control of by-pass gas. Sizes 8" to 14". Type SCN-1 in sizes 3" to 6".

*Patents pending

THE PIG WITH THE POKE
CLEANS PIPE LINES
T. D. Williamson, Inc.
TULSA 9, OKLAHOMA



BEFORE . . . Hot exhaust air re-entering the suction side of these six radiators boosted water and oil temperatures at Pitsch station.

Coolers Block Hot Air Recirculation

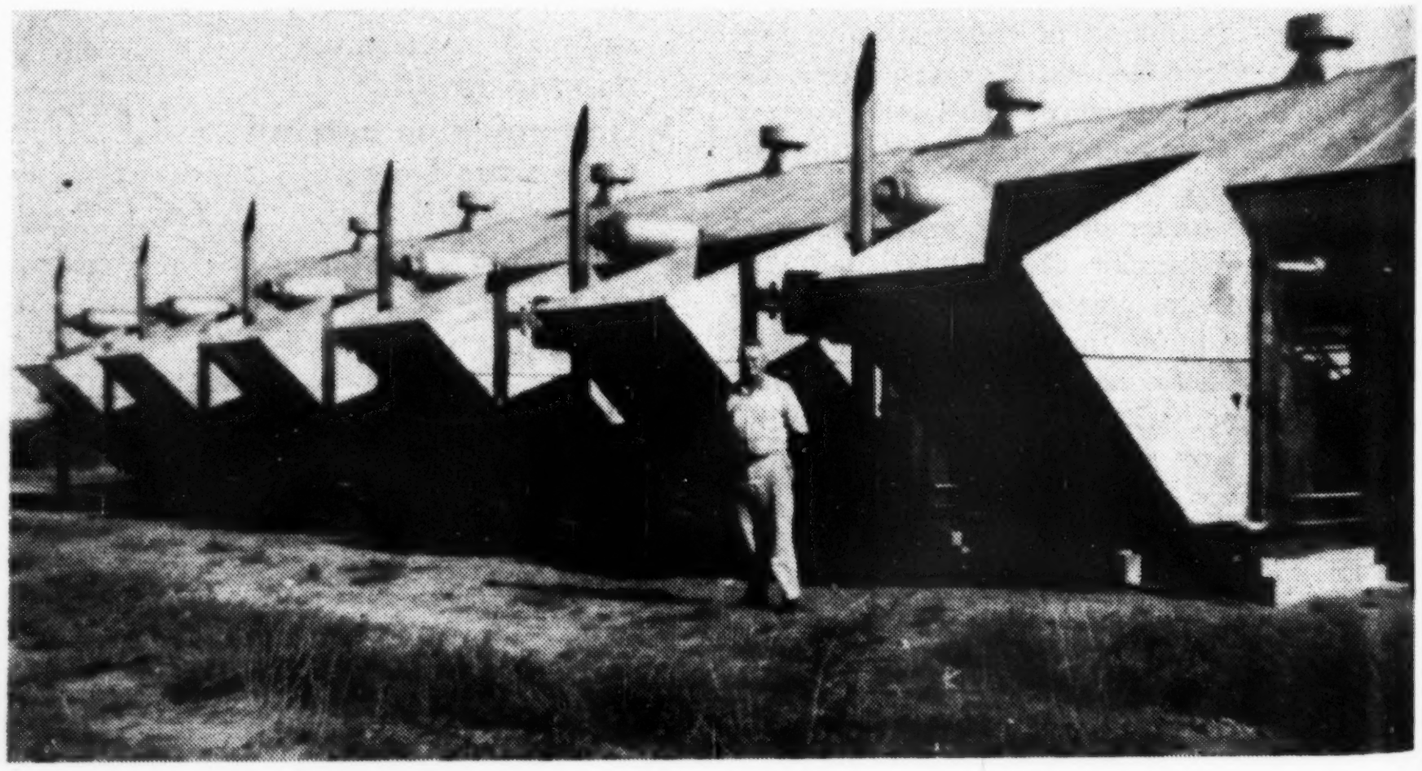
High water and oil temperatures resulting from recirculation of back-draft hot air at the No. 2 Pitsch booster station of the Consolidated Gas Corp., Oklahoma City, 13 miles north of the Shamrock station in the east end of the Panhandle gas field, were considerably reduced by new air-ducts recently installed by W. B. Bertram, in charge of the station.

The coolers were designed by Mr. Bertram, and a considerable saving was effected by having them installed by company workmen.

At this station, built in November 1947 under the supervision of E. Maurice Myers, gas engineer of the company, there are six Young-Happy radiators installed outside the building. Four sets of coils provide for water cooling and two sets of coils for oil cooling. Piping runs from six Clark-MA 4 engines to the radiators. These engines have a booster capacity of 12 MMcf of gas per day.

The ducts as shown in the accompanying picture dissipate the heat upward. This prevents the hot exhaust air from re-entering the suction side of each radiator and has reduced the temperature of the engines about 20°. As the building runs east and west, overheating conditions were worst when unfavorable winds carried the heat back to the radiators.

This station and No. 1 booster station pump gas from the main field and the Shamrock station into the main gas transmission line to Wichita and Hutchinson, Kan.



. . . AND AFTER. W. B. Bertram stands in front of the air ducts he designed, which reportedly reduce engine temperature about 20°.